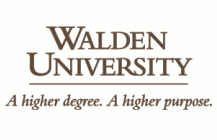

2017

Determinants of HIV Screening Among Adults in New Jersey After Hurricane Sandy

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This is to certify that the doctoral study by

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has been found to be complete and satisfactory in all respects,
and that any and all revisions required by
the review committee have been made.

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2017

Abstract

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by

Nathaniel R. Geyer

MS, Penn State University, 2008

BS, Lebanon Valley College, 2005

Doctoral Study Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Public Health

Walden University

May 2017

Abstract

HIV screening is recommended to destigmatize the condition, prevent partner transmission, and postpone AIDS progression. However, determinants associated with implementation of opt-out HIV screening are not well understood. The purpose of the study was to examine determinants that predicted odds of HIV screening for persons impacted by Hurricane Sandy, and how these factors differed according to demographic characteristics, geographical attributes, health-related quality of life score, access-to-care, and health insurance status. The social ecologic model provided the framework for this multilevel cross-sectional study that included New Jersey data from the Behavior Risk Factor Surveillance System. Bivariate chi-square, simple logistic regression, and adjusted multivariate and weighted logistic regression analyses were performed to estimate HIV screening odds. Findings indicated a significant odds ratio with access to care post-Hurricane Sandy and HIV screening (odds ratio = 1.74, 95% CI = 1.38-2.21). The positive social change implications may include assisting people to develop realistic plans for HIV screening, improving understanding of HIV screening determinants, and raising awareness of the risk factors related with access to medical care post-Hurricane Sandy.

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Dedication

This doctoral study is dedicated in memory of my three grandparents who sadly passed away while I was completing my degree. My late maternal grandmother was a humanitarian who spent her life serving others. Additionally, my late maternal grandfather, who served in World War II, worked for Pan Am Airlines, as well as being a wage earner of a family spanning four generations. They were married for 70 years and were very strong willed, being a model of what it takes to live fulfilling lives. In addition, my late paternal grandfather, who also served in World War II, worked as a teacher, constructor, gardener, businessman, and family man. Finally, this doctoral study is also dedicated to my niece who never let anything deter her from reaching for the stars and making good life-changing decisions to promote positive social change.

Acknowledgments

I acknowledge my committee members: Dr. Vasileios Margaritis, Dr. Nancy Rea, and Dr. Loretta Cain. Dr. Margaritis thanks for being my chair and for your ability to keep me focused, providing balance and a clear direction for completion in a timely manner, thereby allowing me to finish my doctoral journey. Dr. Rea, my second committee member, thanks for offering me guidance, feedback, and quick turnaround times regarding reviewing any modifications. Thank you, Dr. Cain, my university research reviewer, for giving excellent reviews and providing feedback within 14 days. Without each of you giving me exceptional feedback and guidance, I would not have finished my journey at Walden University.

I also recognize my supervisor and other key personnel for their direct contributions and indirect supports to complete my doctoral study. My supervisor provided me the opportunity to work full time while completing my doctorate, allowing me to make the payments on time. Reviewers of two institutional review boards approved my application to collect the necessary data. Health department personnel provided data necessary for my doctoral study. Finally, my friends and family members have given me time, space, and support needed for reading, writing, and editing this capstone.

Data for this study come from the New Jersey Behavioral Risk Factor Survey (http://www.state.nj.us/health/chs/njbrfs/), which is administered by the Center for Health Statistics and Informatics at the New Jersey Department of Health.

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Section 1: Foundation of the Study and Literature Review

My study focused on the relationship between HIV screening practices and HIV-related access-to-care post-Hurricane Sandy to identify determinants with at-risk HIV subpopulations. I used data from the Behavioral Risk Factor Surveillance System (BRFSS) to assess the determinants of HIV screening status for persons post-Hurricane Sandy in New Jersey, as reported by the Centers for Disease Control and Prevention (CDC, 2015a) and the New Jersey Department of Health (NJDOH, 2016a). Policymakers, providers, and individuals should promote opt-out screening for HIV and if infected link into health care services in a given time period (Gardner, McLees, Steiner, Del Rio, & Burman, 2011; McNairy & El Sadr, 2012). This section comprises 11 subsections: (a) the research problems and issues addressed in this study; (b) the purpose of the study; (c) the two research questions (RQs) and associated hypotheses; (d) the theoretical foundation; (e) the literature strategy and review; (f) the nature of the study, including the rationale for the study's design; (g) the terms used in the study; (h) the assumptions for the study; (i) the scope and delimitations addressing validity, study boundaries, and generalizability; (j) the limitations; and (k) the study's significance, including the potential contributions of the study and implications for positive social change.

Problem Statement

HIV screening is the key step for destigmatizing the condition, preventing partner transmission, and postponing AIDS progression (Gardner et al., 2011; McNairy & El Sadr, 2012). To advance routine HIV screening in the general population, several

national public health organizations promulgated the various recommendations. The CDC created a list of amended guidelines encouraging universal opt-out HIV screening (Branson et al., 2006). The National HIV/AIDS Strategy established a goal of expanding access to prevention and medical care services offered to infected individuals (Office of National AIDS Policy, 2016). The United States Preventive Services Task Force (USPSTF) revised the group's HIV guidelines to a *Grade A* recommendation, endorsing proactive/opt-out screening to the *standard of prevention practice* of medical providers for person's age 15 to 64 years (Moyer, 2013). Moreover, the Patient Protection and Affordable Care Act (ACA) increased the availability of health care coverage and stipulated the cost of HIV screening to be covered by insurance without cost sharing (Viall, McCray, Mermin, & Wortley, 2016). My focus in this study was to examine barriers to HIV screening after the implementation of the ACA, the National HIV/AIDS Strategy, the revised CDC guidelines, and the endorsed USPSTF recommendations among adults in New Jersey surveyed using BRFSS.

The general population lacked the understanding of the determinants connected with the continued failure of full implementation of opt-out HIV screening, without supportive data (Viall et al., 2016). The CDC revised the BRFSS questionnaire sampling frame in 2011, finding that HIV screening estimates were higher after the changes (Van Handel & Branson, 2015). Scholars found that full implementation of the three national guidelines still lagged behind the goals of the recommendations (Viall et al., 2016), with only 40% of adults nationwide reporting that they had been screened (Hayek et al., 2015).

The determinants of HIV screening can also be impacted by external influences such as the effects of Hurricane Sandy.

In October 2012, Hurricane Sandy impacted New Jersey, putting a strain on access-to-care and HIV screening efforts (Davidow et al., 2016). New Jersey had about 6.7% of the total cumulative number of HIV diagnosed cases in 2015 in the United States (CDC, 2016). Moreover, the Insurance Information Institute (III, 2016) estimated that Hurricane Sandy was the third most costly tropical storm in the United States. The III assessed that individuals living in New Jersey have a disproportionate number of uninsured properties that are more prone to environmental damages than neighboring states like New York. Davidow et al. (2016) advised that environmental damages caused by Hurricane Sandy compromised health care access for at-risk populations for supplemental medical services. Davidow et al. did not include HIV, which has become a chronic condition for screening and treatment purposes. The impact of Hurricane Sandy on HIV screening in New Jersey has not been reviewed since Hurricane Sandy, as noted by Davidow et al. This circumstance suggests that the NJDOH's HIV screening efforts were scaled back due to Hurricane Sandy.

My evaluation of HIV screening efforts, using national and state-specific BRFSS 2014 questions for cross-sectional data, informed the planning of programs for promotion of HIV guidelines implementation in New Jersey post-Hurricane Sandy. In this investigation, I addressed a gap in knowledge regarding the association among HIV screening, access-to-care post-Hurricane Sandy, and various confounding or moderating influences (i.e., demographic characteristics, geographical region, health-related quality

of life [HRQOL] scores, access-to-care, and health insurance status) to determine the odds of screening variance with each predictor.

Purpose of the Study

The purpose of my quantitative cross-sectional study was to examine the determinants to HIV screening and to determine whether factors predict the use of HIV screening in this sample population. I examined how these factors differed according to demographic characteristics, geographic attributes, HRQOL propensity score, access-to-care, and health insurance status; by analyzing HIV screening in a sample of participants from New Jersey who were impacted by Hurricane Sandy as a subset of the BRFSS study population. Viall et al. (2016) recommended this examination for improved HIV program planning and implementation. Findings helped to inform public health practitioners regarding the improvement of HIV public health screening programs with the ultimate effect of preventing HIV transmission.

Research Questions and Hypotheses

RQ1: Among adults surveyed in the New Jersey BRFSS in 2014, is there an association between HIV screening and demographic characteristics, geographic attributes, health-related quality-of-life propensity score, access-to-care, and health insurance status?

$H_0$1a: Those who are HIV screened versus those not screened for HIV have no differences in proportions of persons from New Jersey by various age groups.

H_a1a: Those who are HIV screened versus those not screened for HIV have a significant difference in proportions of persons from New Jersey by various age groups.

$H_0$1b: Those who are HIV screened versus those not screened for HIV have no differences in proportions of persons from New Jersey by sex at birth.

H_a1b: Those who are HIV screened versus those not screened for HIV have a significant difference in proportions of persons from New Jersey by sex at birth.

$H_0$1c: Those who are HIV screened versus those not screened for HIV have no differences in proportions of persons from New Jersey by race/ethnicity.

H_a1c: Those who are HIV screened versus those not screened for HIV have a significant difference in proportions of persons from New Jersey by race/ethnicity.

$H_0$1d: Those who are HIV screened versus those not screened for HIV have no differences in proportions of persons from New Jersey by marital status.

H_a1d: Those who are HIV screened versus those not screened for HIV have a significant difference in proportions of persons from New Jersey by marital status.

$H_0$1e: Those who are HIV screened versus those not screened for HIV have no differences in proportions of persons from New Jersey by metropolitan area.

H_a1e: Those who are HIV screened versus those not screened for HIV have a significant difference in proportions of persons from New Jersey by metropolitan area.

$H_0$1f: Those who are HIV screened versus those not screened for HIV have no differences in proportions of persons from New Jersey by health-related quality-of-life propensity score, as defined by general health status, physically unhealthy days per month, mentally unhealthy days per months, and days per month of activity limitation.

H_a1f: Those who are HIV screened versus those not screened for HIV have a significant difference in proportions of persons from New Jersey by health-related quality

of-life propensity score, as defined by general health status, physically unhealthy days per month, mentally unhealthy days per months, and days per month of activity limitation

$H_0$1g: Those who are HIV screened versus those not screened for HIV have no statistical differences in proportions of persons from New Jersey by health insurance.

H_a1g: Those who are HIV screened versus those not screened for HIV have a significant difference in proportions of persons from New Jersey by health insurance.

$H_0$1h: Those who are HIV screened versus those not screened for HIV have no statistical differences in proportions of persons from New Jersey by access-to-care.

H_a1h: Those who are HIV screened versus those not screened for HIV have a significant difference in proportions of persons from New Jersey by access-to-care.

RQ2: Are there statistically significant odds ratios of HIV screening among geographic attributes, health-related quality-of-life propensity score, access-to-care, and health insurance status?

$H_0$2: There are no differences in the odds of HIV screening after adjustment by each of the factors to be investigated, by demographic characteristics, geographic attributes, health-related quality-of-life propensity score, access-to-care, and health insurance status.

H_a2: There are significant differences in the odds of HIV screening after adjustment by each of the factors to be investigated, by demographic characteristics, geographic attributes, health-related quality-of-life propensity score, access-to-care, and health insurance status.

Theoretical Foundations for the Study

The social ecological model (SEM), first applied by Bronfenbrenner (1979) and modified by Baral, Logie, Grosso, Wirtz, and Beyner (2013) and the CDC (2015b), provided the theoretical framework for the study. The CDC adopted the SEM for integrating five bands of influence: environmental, community, organizational, interpersonal, and individual. The SEM provided details of how and when individuals are screened for HIV, through bands of influence and risk faced, as noted by Baral et al. (2013). Brawner, Reason, Goodman, Schensul, and Guthrie (2015) applied the model to a Pennsylvania HIV mixed-methods study with ethnographic and geospatial mapping components to report the unequal clusters of smaller epidemics in the community at epicenters and how the state population varied by public and demographic predictors. Hickson et al. (2015) applied the SEM for analyzing HIV risk determinants among non-Hispanic African American males who have sex with males (MSM) in a multisite Southern United States cohort. Another application of this model included an Internet sample of MSM to address the position of nonresidential locations in determining behaviors such as the availability of HIV screening services relative to location (Vaughan, Kramer, Cooper, Rosenberg, & Sullivan, 2016). Using an ecological framework, my focus was on real-world efficacy to understand the dynamics of HIV screening barriers in New Jersey as reported in the national and state BRFSS data set (Figure 1). According to the CDC, Figure 1 was a product of the U.S. government and was in the public domain, so permission was not required for use, but I credit the Colorectal Cancer Control Program and all contributors for creating the graphic.

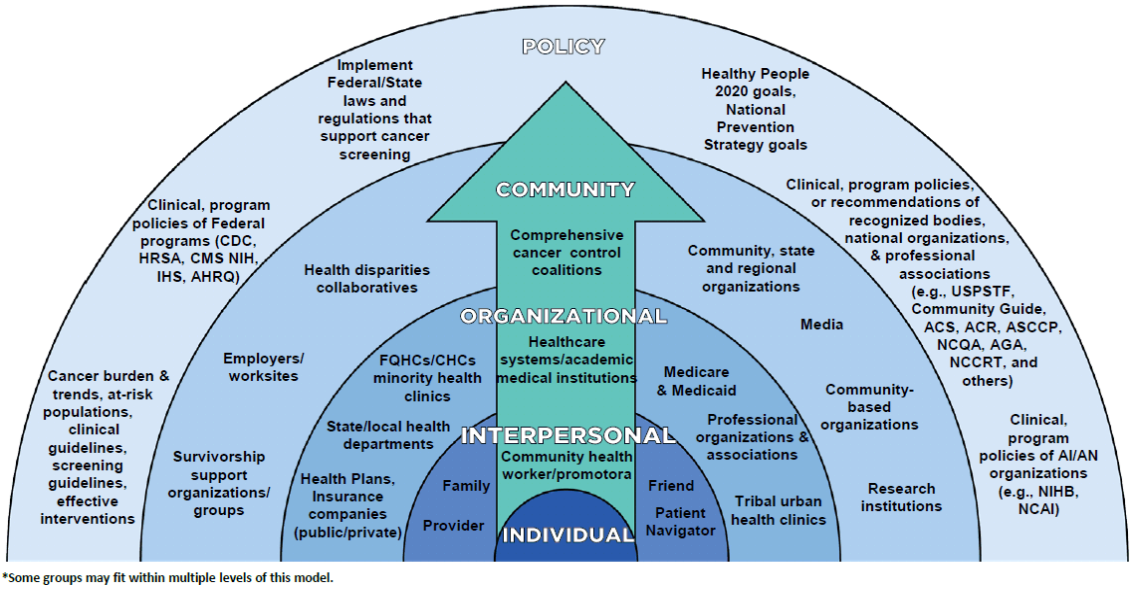

Figure 1. Diagram of the social ecologic model adapted from Centers for Disease Control & Prevention, Colorectal Cancer Control Program. (2015b). Social ecological model. Retrieved from http://www.cdc.gov/cancer/crccp/sem.htm

Although the CDC (2015b) first applied the SEM framework to cancer screening, it can be applied to HIV screening as well. The application of the SEM to this investigation included (a) policy, CDC promotion of universal HIV screening; (b) community, MSA status; (c) organizational, access to insurance and medical care; (d) interpersonal, marital status; and (e) individual, demographic attributes and HRQOL score. The BRFSS data set can be used in multilevel cross-sectional studies through the application of weights, as noted by Pierannunzi, Town, Gavin, Shaw, and Balluz (2012).

Nature of the Study

In this multilevel quantitative study, I used existing random-digit-dialing cross-sectional data from noninstitutionalized adults in New Jersey. The nature of this investigation was consistent with the SEM as adapted from the CDC (2015b). The independent screening determinants in this study included (a) policy, CDC promotion of

universal HIV screening; (b) community, geographical attributes; (c) organizational, access to insurance and medical care; (d) interpersonal, marital status; and (e) individual, HRQOL propensity score and demographic attributes. My focus was a cross-section of adults with the key determinants of HIV screening in a given year in New Jersey.

Literature Search Strategy

Three databases (PubMed, Medline, and Cochrane), two libraries (local and Walden University), and Google Scholar were examined to locate scholarly journal articles. Key words were used in meta-analyses and previously cited references to assist in the finding and seeking of relevant literature; also, I used a dictionary and thesaurus to expand the number of key words. All key words were combined with standard key words from the PubMed, Medline, and Cochrane databases. Google Scholar was used to find sources included in other databases; I linked sources to the world catalog, local library, and Walden collections using the library link. Some of the key words used in this literature review were *HIV or immunodeficiency and screening*, *access to care*, *continuum of engagement HIV*, *social ecologic model*, *rurality*, *HIV epidemic in New Jersey*, and *Hurricane Sandy*. I also used the cited-by function in Google Scholar to find additional sources published between 2013 and 2017.

Literature Review

In this subsection, I examined literature on Hurricane Sandy, HIV epidemic in New Jersey, continuum of engagement of HIV/AIDS, and U.S. policies on HIV. In addition, I review key covariates including age, insurance type, race/ethnicity, sex, marital status, geographical status, primary health insurance, access to medical care, and

HRQOL. Finally, I described the gaps in the literature relating to determinants of HIV screening.

Hurricane Sandy

Hurricane Sandy was the second most expensive tropical storm that hit Northern New Jersey on October 29, 2012, during the time of high tide along the Atlantic Coast contributing to record tide level in New Jersey, New York, and Connecticut (Blake, Kimblerland, Berg, Cangialosi, & Beven, 2013). The tropical storm caused excessive property damage in 10 out of 21 mostly urban counties in New Jersey (Blake et al., 2013). The III (2016) assessed that individuals living in New Jersey have a disproportionate number of uninsured properties that are more susceptible to environmental damages than in neighboring states like New York. Furthermore, Pouget, Sandoval, Nikolopoulos, and Friedman (2015) found that Hurricane Sandy can alter environmental and behavioral factors in HIV high-risk individuals. Davidow et al. (2016) found that after Hurricane Sandy reached New Jersey, individuals with greater medical care needs (e.g., uninsured, evacuees, foreign borne, and people with special needs) are at risk for compromised access to treatment. Therefore, I conducted an investigation of HIV screening after Hurricane Sandy and the impact on New Jersey's at-risk subpopulations.

HIV Epidemic in New Jersey

According to the CDC (2016), New Jersey had about 6.7% of the total cumulative number of HIV diagnosed cases in 2015 in the United States, predominately in non-Hispanic Blacks and Hispanics followed by non-Hispanic Whites, in 2015. Amongst New Jersey's MSAs, Camden and Newark reported more than 45% of the total number

of HIV diagnoses in the state (CDC, 2016). Moreover, the NJDOH estimated that there were more than 37,000 individuals living with HIV in 2015 (NJDOH, 2016b). Of the counties impacted by HIV, the hardest hit were mostly from the northern counties (NJDOH, 2016b), which were also the hardest hit from Hurricane Sandy (Blake et al., 2013). As a result, I conducted a study on the HIV epidemic's impact on at-risk subpopulations impacted by Hurricane Sandy.

Continuum of Engagement in HIV-Related Care

Gardner et al. (2011) first applied the continuum of engagement model for HIV-related care as a follow-up to Granich, Gilks, Dye, De Cock, and Williams's (2009) test-and-treat model. Using a sample of heterosexual participants in South Africa, Granich et al. found that if people are screened and put on HIV treatment, then transmission of HIV can be curbed by 2050. The test-and-treat model was criticized by Kretzschmar, van der Loeff, and Coutinho (2012) as wishful thinking that fails to take into consideration the variability of infectiousness via viral load measurements, population heterogeneity that influences the transmission rate, and decreasing awareness of the impact of HIV in society, making HIV elimination an unrealistic proposition. Robertson, Laraque, Mavronicolas, Braunstein, and Torian (2015) examined HIV suppression time and found that linkage-to-care was connected to increased viral containment, in New York City. Kretzchmar et al. (2012) stated that some parts of test-and-treat are feasible, including increasing HIV screening, treatment coverage, and adherence, which form some key milestones of the continuum of engagement into care model. Unlike test-and-treat, the endpoint is not HIV elimination but rather a stepwise approach to develop ways to

decrease the number of HIV cases who are not engaged into care. The continuum of engagement into care model has seven key milestones including HIV infected, HIV diagnosed, linked to HIV care, retained in HIV care, antiretroviral therapy needed, on antiretroviral therapy, and adherent or undetectable (Gardner et al., 2011). However, it is estimated that only 20% of people who are HIV infected have an undetectable viral load (Gardner et al., 2011). I focused this investigation on HIV screening and access to care components of the continuum of care model.

United States National Policies on HIV/AIDS

There are four integrated national policies that can be used to address gaps in HIV screening. First, the CDC published a revised policy on opt-out screening (Branson et al., 2006). Second, the Office of HIV Policy put out the National HIV/AIDS strategy to help implement HIV screening as a more integrated service (Office of National AIDS Policy, 2016). Third, the USPSTF revised HIV screening as a Grade A recommendation (Moyer, 2013). Fourth, the ACA made all USPSTF Grade A recommendations reimbursable by health insurance (Viall et al., 2016). In this section, the four national policies and some possible gaps that prevent full implementation of these guidelines in New Jersey are discussed.

CDC HIV guidelines. The CDC created a list of amended guidelines encouraging universal opt-out HIV screening (Branson et al., 2006). Hayek et al. (2015) found that, in 2010-2011, health departments providing HIV screening kits led to an increased percentages (14% in 2010 vs. 16% in 2011) of state residents reporting a test, as reported by the BRFSS. The CDC guideline encouraged states to implement opt-out screening

whereby everyone who sees a practitioner is offered a HIV screen unless he or she refused (Branson et al., 2006). Additionally, the recommendation also discouraged dedicated HIV screening forms and encouraged HIV as one of many possible screenings (Branson et al., 2006). One solution to categorize high-risk people with behaviors that should be screened for HIV is by applying a sum-of-score of possible HRQOL factors to determine if it is a determinant to HIV screening.

National HIV/AIDS strategy. The mission of National HIV/AIDS strategy is to ensure that the United States becomes a country where infections are rare, and people who are HIV positive are linked to HIV-related services. Seth, Wang, Collins, and Belcher (2015) found the National HIV/AIDS strategy's goal of 85% of individuals linked to HIV medical care has not been met in newly diagnosed HIV cases. However, Seth et al. excluded missing information for linkage-to-care HIV clinics, and all of the four site types had linked to care except for HIV clinics. Golden, Bennett, Dombowski, and Buskin (2016) noted that the strategy has succeeded in King County, Washington and found a decline in the number of MSM who were newly HIV diagnosed, including Black MSM. These studies indicated that the 5-year goals for the strategy have not been achieved and need more time.

USPSTF HIV guidelines. The USPSTF revised the HIV screening guidelines to a Grade A recommendation, essentially endorsing proactive/opt-out screening as the standard of prevention for person's age 15 to 64 years (Moyer, 2013). The HIV screening protocol is also focused on all pregnant women getting screened for HIV (Moyer, 2013). Based on this recommendation, it is critical to offer HIV screening not in isolation but

rather concurrently with other health screenings, which serves as justification for the ACA mandating the insurance coverage of HIV screening.

Affordable Care Act and HIV. The ACA goals increased the availability of health care coverage, improved access to insurance coverage, ensured quality insurance coverage, and enhanced the capacity of the health care delivery system (Viall et al., 2016). The law stipulated the cost of HIV screening be covered by insurance without cost sharing (Viall et al., 2016). Landers (2016) found that health departments located in 93% of U.S. counties should provide clinical services because of health profession shortage areas and lack of public funding for services. Additionally, Hellinger (2015) found that in New Jersey, between 2012 and 2014, the percentage of declined uninsured HIV patients fell to 0.1%, and saw a decrease in the number of hospitalizations. This means that the ACA can be a justification for the use of the primary insurance variable, in the BRFSS.

Sex and HIV/AIDS

The HIV epidemic has a difference based on birth sex where males are more likely to transmit to other males via MSM, injection drug use (IDU), MSM-IDU, or heterosexual contact. However, females are still at risk via IDU or heterosexual contact. This means that although there is an increased proportion of males who transmit to other males, women are still at risk of transmission and due to sex inequality are less likely to be in HIV treatment (Richardson et al., 2014). However, the CDC (2016) estimated that, between 2010 and 2015, the HIV prevalence rates of female adults and adolescents decreased, but rates remained stable in males, which amounted to about 81% of all HIV diagnoses in both adolescents and adults.

Males and HIV/AIDS. According to the CDC (2016), about 75% of HIV infected people were male, and 70% were MSM. Males who are non-Hispanic Black have the highest rates of HIV diagnosis (CDC, 2016). Bradley et al. (2014) found that 21% of 12,255 cases in 2011 were not linked to care within 90 days. However, the number of males who know their HIV status is low compared to women worldwide due to HIV screening due to prenatal care (Hensen et al., 2014). In addition, males may be reluctant to access health care due to stigma, leading to decreased chances for repeat screening for high-risk HIV negatives and HIV positives not in care (Hensen et al., 2014). Moreover, Xia et al. (2017) stated that HIV incidence had decreased from 38,164 in 2003 to 33,035 in 2010 for males. Findings from these studies justify the need for additional research in improving HIV screening to increase the number of males who know the person's HIV status and are linked to care.

Females and HIV/AIDS. Women account for one in four people identified with HIV in the United States (CDC, 2016). These females with HIV tend to be infected via heterosexual contact (CDC, 2016). Bradley et al. (2014) found that 18% of 3,194 cases in 2011 were not linked to care within 90 days. Richardson et al. (2014) stated that sex inequality worldwide impedes the ability for females to receive equal access to HIV treatment; with 53% of women are enrolled in care within 90 days after HIV diagnosis, (Ferguson et al., 2014). Xia et al. (2017) stated that HIV incidence had decreased from 13,557 in 2003 to 6,616 in 2010 for females.

Race/Ethnicity and HIV/AIDS

In the United States, there is a disproportionate number of racial/ethnic minorities who are diagnosed with HIV as compared to non-Hispanic Whites. The CDC (2016) reported the HIV diagnosis rate increased between 2010 and 2015 for Asian Americans and Native Americans. The HIV screening rate decreased for Hispanics, Pacific Islanders, and multiracial groups, and was stable for non-Hispanic Whites and non-Hispanic Blacks (CDC, 2016).

Non-Hispanic Blacks and HIV/AIDS. Non-Hispanic Blacks represented one of the leading populations of HIV-infected people in the United States, impacting areas already stressed with socioeconomic challenges, indicating great potential among non-Hispanic Blacks. Bradley et al. (2014) found 24% of 7,880 cases in 2011 were not linked to care within 90 days; 45% of 56,000 new infections in 2006 were attributed to non-Hispanic Blacks (Castel et al., 2012). Non-Hispanic Blacks have an undetectable community/plasma viral loads (CVL; ≤400 cells/μL) of ~52.6 (Crepaz et al., 2016); non-Hispanic Blacks with two sustained high viral loads (SHVL; >100,000 cells/μL) were more likely than non-Hispanic Whites to have suboptimal engagement in care (Xia, Weiwal, Braunstein, Kersanske, & Torian, 2015). Morooka and Lampkins (2014) found that age, education, and marital status were important factors in determining whether African American women were HIV screened. Based on these findings, non-Hispanic Blacks are at risk of not being linked to HIV services in a timely manner.

Hispanics and HIV/AIDS. According to the CDC (2016), the rates of new HIV infection amongst Hispanic subpopulations were 3 times that of non-Hispanic whites or

24% of HIV diagnoses. Additional studies on persons perceived to be Hispanics in the United States showed that 18% of 3,004 cases in 2011 are not linked to care within 90 days (Bradley et al., 2014); 5% Hispanics have no reported CVL and Hispanics have a proportion of undetectable CVL (≤400 cells/μL) viral loads of ~67.0 (Castel et al., 2012); Hispanics with two SHVL, were more likely than non-Hispanic whites, suggesting suboptimal engagement in care (Xia et al., 2015). CDC estimated 215,721 Hispanics have been diagnosed with HIV in 2014, with 104,222 cumulative deaths amongst people diagnosed with AIDS (CDC, 2016). Ortega, Rodriquez, and Bustamante (2015) mentioned a large number of undocumented Hispanics may be less likely to access preventive services because of stigma and fear of deportation. A California HIV study, in 50 year or older, found that Hispanics were less likely to be HIV screened suggesting the need for health education and promotion efforts to increase HIV screening and disease prevention among 50 and older, a group perceived as low-risk (Geyer, Parham, Wallace, & Washington, 2013). This means that HIV mortality amongst Hispanics in the United States ranks as one the leading causes of deaths and a serious public health problem.

Age Groups and HIV/AIDS

Among the age groups of people diagnosed with HIV, there was an increase in the number of 13-14, 20-29, and older than 60 year olds infected with HIV in 2010-2015 (CDC, 2016). However, the rates of 15-19, 35-39, and 40-44 decreases, and the younger than 13 year olds, 30-34, and 45-59 remained the same (CDC, 2016). Based on this source the HIV epidemic in the United States tends to be concentrated in younger and

older adults, 13 and older. However, the BRFSS data set was only asked to adults 18 years and older, thereby excluding 13-17 year olds from this analysis.

Young adults and HIV/AIDS. Young adults aged 13 to 24 years counted for 26% of newly diagnosed adults, with 22% among MSM, and 50% of youth who are unaware of his or her HIV status (CDC, 2016). Bradley et al (2014) found that 24% of 3,445 cases in 2011 are not linked to care before 90 days. Zanoni and Mayer (2014) found that approximately 41% of HIV infected young adults are aware of their diagnosis. This is significantly lower then found in the general population infected with HIV (Gardner et al., 2011). Additionally only 6% of HIV-infected young adults in the United States are virally suppressed (Zanoni & Mayer, 2014). This suggests the younger adults, 18-24 years, may be at risk of transmitting HIV, in New Jersey.

Older adults and HIV/AIDS. Person aged 55 or older accounted for approximately 20% of people diagnosed with HIV. The number of HIV or AIDS case ages 50 years and older has been increasing due to better therapeutic treatment, such as HAART; accounting for 15% of new HIV diagnoses, 24% of prevalent HIV/AIDS cases, 19% of all AIDS diagnoses, 29% of those living with AIDS, and 25% of all HIV-related deaths (CDC, 2016). Several studies, which reported on HIV or AIDS cases who are 50 and older suggest great potential for transmission from this reservoir, for example 16% of 1,315 cases in 2011 are not linked to care within 90 days (Bradley et al., 2014); ages 50 and older have a proportion of undetectable CVL of ~70.0 (Castel et al., 2012); ages 50 and older with two SHVL were less likely than younger adults under 50, suggesting

suboptimal engagement in care (Xia et al., 2015). This suggests that there may be suboptimal HIV screening in older people living in New Jersey.

Sexual Orientation and HIV/AIDS

HIV is spread in sexual or blood-to blood transmission in heterosexuals, injection drug users, or MSM. In 2010-2014, the number of HIV diagnoses in males attributed to MSM increased or heterosexual contact decreased in the United States (CDC, 2016). During same time period, the number of HIV diagnosed in females that were attributed to IDU or heterosexual contact decreased (CDC, 2016). Moreover, in 2015 among MSM and MSM-IDU accounted for 70% of new HIV diagnoses, which increased to 94% when including heterosexual contact (CDC, 2016). A meta-analysis of heterosexual males found multilevel barriers to care factors including unemployment, poverty, lack of educational opportunities, and HIV marginalization (Zaller, Fu, Nunn, & Beckwith, 2011). People who exhibit a transmission risk male to male sexual intercourse. Despite the recognition of this disproportionate impact of the MSM subpopulation, the incidence of HIV/AIDS diagnoses in 33 states increased by 8.6%, with approximately 38,000 diagnosed in New York City alone, requiring more frequent HIV screening and linkage-to-care (Reilly et al., 2014). Hutchinson, Farnham, Sansom, Yaylali, and Mermin (2016) added that HIV screening of MSM quarterly is more cost-effective compared with annual HIV screening, in the United States. This makes it critical to understand the potential of transmission from a standpoint of a reservoir of people, who are heterosexual, MSM, and injection drug use. However, this topic was not asked in the New Jersey version of the BRFSS 2014, limiting the ability to adjust for sexual orientation.

Marital Status and HIV/AIDS

Researchers need to clarify how marital status drives the HIV screening after ACA. Roundtree, Chen, Brown, and Pomeroy (2009) found a key connection between HIV screening and marital status. For example, individuals who separated were likely to be HIV screened, while persons who were married, constitute those persons with no evidence of HIV screening (Roundtree et al., 2009). Ford, Godette, Mulatu, and Gaines (2015) used the 2010 BRFSS data and found comparable results with older married pairs having lower odds of HIV screening. However, Ford et al. and Roundtree et al. did not take into consideration insurance status and the revised weighting schema of the BRFSS data set; newer optional and state-specific questions on primary health insurance, and access to care post-Hurricane Sandy.

Rurality at Residence and HIV/AIDS

The HIV epidemic has a varying degree of access to care in urban MSAs versus rural, non-MSAs. There are multiple definitions of rurality based on different agencies, such as the United States Census Bureau, Rural Urban Commuting Area (RUCA), based either on county of residence or census tracts, leading to misclassification bias and differences in proportions of newly diagnosed HIV cases (Weissman et al., 2014). Moreover, Carrel, Enron, Emach, and Hurt (2014) found HIV geospatial disparities between rural and urban areas, amongst at-risk HIV cases such as MSM, non-Hispanic blacks, and those aged under 30 years, all needing medical services in North Carolina. The estimation of poverty status varies by level of rurality in the relationship of newly diagnosed HIV cases in various racial ethnic groups (Vaughan, Rosenberg, Shouse, &

Sullivan, 2014). The BRFSS accounts for rurality through the MSA status variable, which can be used in New Jersey.

Primary Health Insurance Status and HIV/AIDS

Ever since the passing of ACA legislation, HIV screening should have been covered by all health insurance companies including: private, Medicaid, Medicaid, and other insurances. Zhang et al. (2014) found that Medicaid enrollees diagnosed with HIV and living in southern states, linkage into care was suboptimal with only ~35% received antiretroviral medication that is inconsistent with the National HIV/AIDS Strategy guidelines, adjusted by age group, race/ethnicity, rurality, and enrollment in health insurance status. Yehia et al. (2014) found that funding for linkage of care HIV services were frequently covered by Medicaid in women, non-Hispanic blacks, Hispanics, and injection drug users, all over the United States. Berry et al. (2016) found that after passage of ACA, provider visits for HIV had better odds of being on Medicaid and a lesser probability of being on private insurance. Dietz et al. (2015) found that Medicaid was the most common type of insurance for HIV screenings. Although these four studies focused on Medicaid, the ACA stipulates that all insurances pay for HIV screenings.

Access-to-Care and HIV/AIDS

Access to HIV-related medical services is a critical step in the process of postponing the progression to AIDS and death, yet there is no standard definition of access- or linkage-to-care. Keller et al. (2013) stated that linkage of care varied in definitions in different studies as number of clinical visits after HIV or laboratory screening results. Keller et al. results showed a sensitivity analysis of linkage-to-care

using HIV surveillance from Philadelphia, Pennsylvania, that was defined as times to clinic visits or using laboratory procedures. Bradley et al. (2014) estimated that 66% are diagnosed, but not in care and 70% of those individuals not in HIV-related treatments are not virally suppressed. Therefore, I am stressing the importance of determining access-to-care amongst those individuals HIV screened.

Linkage-to-care using clinical visits is defined as attending one medical appointment or laboratory screening results within 90 days (Bradley et al., 2014; Edelman et al., 2015). For example, Edelman et al. (2015) found that 20% of people presumed to be in care but had no viral loads in each 6-month time interval, resulting in differences in the sample sizes. However, in order to be not in care typically defined as failure to make two visits at least two months apart in the past year or at risk of dropping out to care (Bradley et al., 2014). According to Maulsby et al. (2015), people are at-risk of dropping out when there is a 6 months gap in care, a history of missing appointments, or experience barriers such as transportation or homelessness challenges. By addressing linkage-to-care amongst people not attending clinical visits, Maulsby et al. increased the access-to-care rate from older estimates, by Gardner et al. (2011) of 59% to 88% in the Positive Charge initiative. Therefore, by using at least two clinical visits to determine and address individuals who are not accessing treatment could improve the linkage-to-care and other gaps in later stages of HIV Continuum of Care. This also means that people who are linked to care have evidence of access to care that could potentially be compromised with natural disasters, such as Hurricane Sandy.

Health-Related Quality of Life Propensity Scores and HIV/AIDS

The calculation of the HRQOL score has had various implementations and most used inconsistent definitions. Emlet, Fredriksen-Goldsen, and Kim (2013) defined HRQOL as mental and physical quality of life in HIV-infected MSM populations. Blosnich and Silenzio (2013) only defined HRQOL as physical health in lesbian, gays and bisexual U.S. Veterans. Moreover, Odom, Fang, Zack, Moore, and Loustalot (2016) used HRQOL to understand the self-reported general health status and three measures of unhealthy days the cardiovascular health, categorizing the variable as a sum-of-score, based on the BRFSS 2013 data set. Bucciardini et al. (2016) used factor analysis of HRQOL influences in order to understand the self-reported symptoms of populations living with HIV. For the calculation of the HRQOL propensity score, I am applying Odom et al. (2016) HRQOL scores to HIV screening.

Literature Review Summary

Based on my literature review there are gaps in the HIV policy implementation and the methodological application of the newly added optional and state-specific questions in BRFSS studies. I am applying policy and methodology into an adjustment of HIV screening determinants in New Jersey. Although the study is cross-sectional only looking at post-Hurricane Sandy, it is one of the first to use BRFSS questions from the core, optional, and state-specific questionnaires after the change in methodology in 2011.

Policy implementation gaps. Despite the efforts of the four national guidelines the endpoints have not been fully carried out. For example, Viall et al. (2016) stated the benchmark of screening of one in eight persons who are living with HIV has not been

met despite the promotional efforts of the CDC's and USPSTF's guidelines, the National HIV/AIDS Strategy, and the ACA. Leibowitz, Garcia-Aguilar, and Farrell (2015) found that opt-out HIV screening requirements is a key first step, but Mahajan et al. (2016) noted that HIV-related stigma remains a barrier to effective HIV screening, in both providers and patients. The number of hospitalizations by persons with HIV decreased by one-third even though the HIV population rose by more than 50%, in 2000 thru 2013 (Hellinger, 2016). Despite this decrease in hospitalization in five states, including New Jersey, the reasons for this shift are still unclear and need to be investigated (Hellinger, 2016). Due to these barriers the impact of not fully implementing the guidelines and problems with Hurricane Sandy has made it a challenge for the recommendations to be fully recognized in New Jersey.

BRFSS methodology gaps. Prior to 2011, previous analyses of the BRFSS could only use sampling methodology from landlines, increasing the chance of selection bias Therefore, the BRFSS for the first time started collecting data from landlines and cellular phones, improving the weighting approach, via raking, in 2011, therefore the survey was more population based (Pierannunzi et al., 2012). Previously, the survey was only landlines and the survey was using poststratification, which increases the bias of the survey because of the declining use of landline telephones (Pierannunzi et al., 2012). Unfortunately, the usage of the weighted sampling produced trend results for HIV screening that are not in line with previous estimates, discouraging many from analyzing the data (Hayek et al., 2015). For example, Ford et al. (2015) used the BRFSS 2010 to understand the effects of HIV screening in older Americans, which at the time of

publication was historical. This means that my usage of newer BRFSS data can be used to understand the effects of HIV screening post-Hurricane Sandy.

Research question gaps. Hayek et al. (2015) questioned the validity of the newer BRFSS for trend analysis; the revised questionnaire is largely not analyzed. However, in 2014 the CDC focused some BRFSS optional sections on understanding the effects of the ACA on insurance availability (CDC, 2015a). During the same time NJDOH added state-specific questions on access to care post-Hurricane Sandy (NJDOH, 2016a). Davidow et al. (2016) was the only study that used both of these questionnaires and did not account for HIV screening in this investigation, in New Jersey.

Definitions

Access to medical care after Hurricane Sandy: Variable that addresses whether an individual needed medical treatment through the time during or immediately following Hurricane Sandy, on October 29, 2012 (NJDOH, 2016a).

Acquired immunodeficiency syndrome (AIDS): Advanced Stage 3 HIV infection caused by not linking to HIV-related care in a timely manner (CDC, 2016).

Age groups: Years of life at time of survey, as defined by 18–24, 25–34, 35–44, 45–54, 55–64, and ≥65 (CDC, 2015a).

Ethnicity: The culture of people in a given geographic region, such as Hispanic or non-Hispanic (Bhopal, 2004).

Gender: The personal preference of being male or female, including male, female, and transgender (Cahill & Makadon, 2014).

Health-related quality of life (HRQOL) propensity score: Measured using four self-reported indicators of the BRFSS: (a) general health status, (b) physically unhealthy, (c) mentally unhealthy, and (d) activity limitation (Odom et al., 2016).

Heterosexual contact: Male-to-female sexual intercourse, who exhibit the second largest population infected with HIV at 24% (CDC, 2016).

Linkage-to-care: Earliest laboratory screening result (i.e., CD4 T-lymphocyte or viral loads) or clinical visit based on claim dates (Keller et al., 2013).

Marital status: the presence or absence of a marital relationship and including the status of married, separated, divorced, widowed, single, or unmarried (Kreider & Simmons, 2003).

Medicaid: Joint state and federal health insurance program providing free or low-cost health coverage to millions of Americans, including low-income people, families and children, pregnant women, the elderly, and people with disabilities, also known as Medical Assistance (Cohen, Colby, Wailoo, & Zelizer, 2015).

Medicare: Federal health insurance program for people 65 years or older, certain younger persons with disabilities, and individuals with end-stage renal disease (Cohen et al., 2015).

Men-who-have-sex-with-men (MSM): Men who engage in male-to-male sexual intercourse, composing the largest population infected with HIV at 70% (CDC, 2016).

Metropolitan statistical area (MSA): Geospatial entity that contains a core urban area of 50,000 or more people, and consists of counties containing the essential urban

locations, as well as any adjacent counties with a high degree of socioeconomic integration (United States Census Bureau, 2016).

Race: Biologically distinct populations within the same species, such as White, Black, Asian, Pacific Islander, or multiracial (Bhopal, 2004).

Sex: Biologically assigned at birth based on an original birth certificate, such as male or female (Cahill & Makadon, 2014).

Sexual orientation: Culturally defined gender identities based on personal preferences, such as straight, gay or lesbian, and bisexual (Cahill & Makadon, 2014).

Assumptions

One key assumption for the study was the SEM provided a framework for understanding the dynamic interplay between persons, environments, and interactions (Stokols, 1996). Because the data were collected from the BRFSS, it was possible to use the presumed weights found in the data; however, the weighted samples were assumed based on the CDC variables. Data were cross-sectional and self-reported, which challenges the reliability and validity of the data set (CDC, 2015a). Because the data had been validated by CDC and NJDOH, I assumed that the responses to the questions were accurate and correct. The five assumptions of a chi-square test included individual level data, mutually exclusive categories, independence, nominal or ordinal categories, and values should be five or more in 80% of the cells (McHugh, 2013). The six assumptions of logistic regression methodology included (a) binary or ordinal dependent variable, (b) factor of one is the desired outcome, (c) model should be fitted correctly, (d) independent

error terms, (e) linearity of independent variables and log odds, and (f) data set has a large sample size (Hosmer & Lemeshow, 2000).

Scope and Delimitations

The scope of this study was descriptive, and conclusions are only generalizable to the state of New Jersey. This study focused on the subpopulation of persons residing in New Jersey who were surveyed in BRFSS 2014. The SEM framework was chosen to account for the multilevel influences of HIV screening post-Hurricane Sandy. Moreover, the study focused on part of the continuum of engagement, as articulated by Gardner et al. (2011), that focused on HIV screening and access to medical care; therefore, the later stages of the model could not be reasonably ascertained in BRFSS.

Study Boundaries

Although the BRFSS contains questions on a variety of topics, I did not use geospatial mapping approaches in this analysis. Geospatial mapping approaches by zip codes or MSA attributes were not used because the data did not exist in the BRFSS mapping section, which stopped after 2010 (CDC, 2015a). Although zip code data exists in the NJDOH data, access was a challenge because of personal identifying information (NJDOH, 2016a). I suggested in my analysis that HIV screening be offered as part of other health care screenings.

Generalizability and Scope

The generalizability of this investigation is limited to the state of New Jersey. The scope of this study was on HIV screening and access to care post-Hurricane Sandy, and confounders included age, race-ethnicity, sex, marital status, geographical attributes, and

primary health insurance. In the New Jersey BRFSS, sexual orientation was not asked in the 2014 data set, limiting my ability to do an analysis using this variable (NJDOH, 2016a). Although, Hurricane Sandy targeted New Jersey in October 2012, it was not possible to gain access to care pre-Hurricane Sandy data, so a pre/posttest methodology was not used.

Significance of the Study

This may be one of the first studies that included the revised BRFSS survey to examine the association between HIV screening and access to care post-Hurricane Sandy, with combined core, optional, and state-specific questionnaires. This study addressed the challenge of classifying and determining areas with suboptimal access to care. More specifically, the study focused on the linkage-to-care to implement the National HIV/AIDS strategy's benchmark of reaching 80-85% of HIV persons who successfully have access to care (Office of National AIDS Policy, 2016; Seth et al., 2015). Linking people screened for HIV decreases the chances of AIDS progression, prolongs the lives of persons diagnosed with HIV, prevents transmission to partners, and provides an opportunity for enhancing health care equality (McNairy & El-Sadr, 2012; Yehia et al., 2014). This project supports the mission of positive social change by providing a better understanding of HIV screening determinants, with the aim to raise awareness and to determine risk factors that caused a decline in access to medical care post-Hurricane Sandy for individuals in New Jersey. Findings may assist policymakers, epidemiologists, community planning group members, and other key stakeholders in determining at-risk subpopulations.

Significance to Theory

I used an ecological framework adapted to a public health framework. The BRFSS allowed for multilevel analyses of cross-sectional data containing self-reported information for individual to environmental levels, which made the application of an ecological framework feasible. McElfish, Post, and Rowland (2016) stated that the SEM prospective should include interventions and multiple social-ecological levels to address health disparities. The framework addressed linkage-to-care and social-ecological barriers to HIV screening post-Hurricane Sandy.

Significance to Practice

HIV disproportionately impacts lower income individuals and is a public health insurance nightmare that includes comparable populations (Johnston et al., 2013). The impact of Hurricane Sandy was significant because it supported the need for resources and sufficient property insurance coverage in areas that had a moderate probability of been affected by tropical storms (Blake et al., 2013; III, 2016). By investigating the determinants in HIV screenings after Hurricane Sandy, I adjusted for both the high CDC (2015b) ranking, for New Jersey for HIV-infected population, and Hurricane Sandy's impact on at-risk populations noted by Pouget et al. (2015). People who have chronic or infectious diseases need practical solutions to improve their quality of life.

Significance to Social Change

This project supported positive social change in how the NJDOH provides HIV screening and access to care. Findings may support the National HIV/AIDS strategy to increase the number of people screened for HIV (Office of National AIDS Policy, 2016).

Finally, this project may improve understanding of the determinants of HIV screening; with the aim to raise awareness and to determine risk factors associated with access to medical care post-Hurricane Sandy.

Summary

This section included a review of the literature associated with HIV screening in New Jersey. I identified the risk groups that may not be timely linked to care. Furthermore, I justified the application of the SEM as the theoretical framework, highlighting the variety of different approaches that can be applied into public health research. Additionally, I discussed HIV epidemiology, pertinent at-risk populations, and justification for using secondary data sources, such as BRFSS. The next section presents the methodology and design used in the study.

Section 2: Research Design and Data Collection

In the previous section, I provided a review of the current literature on the epidemiology of HIV screening, with an emphasis on access-to-care barriers including race/ethnicity, sex, age, marital status, regional classification, health insurance, and HRQOL propensity score. My review of the literature addressed the importance of using data sets to determine access-to-care status in a state impacted by Hurricane Sandy. I investigated the HIV screening status in a subset of people surveyed in BRFSS residing in New Jersey and impacted by Hurricane Sandy. This section presents the specifics of the study design, sample, and analytical techniques used to address the literature gap.

Research Design and Rationale

The purpose of my quantitative cross-sectional study was to examine the determinants to HIV screening and to determine whether factors predict the use of HIV screening in this sample population. I examined how these factors differed according to demographic characteristics, geographic attributes, HRQOL propensity score, access to care, and health insurance status; inspected HIV screening in a sample of participants from New Jersey who were impacted by Hurricane Sandy as a subset of the BRFSS study population. Because the data had been collected for CDC and state-specific purposes, there was no time restriction regarding the design and data collection.

Secondary Data Analysis Methodology

The data analysis technique used for RQ1 was Pearson's chi-square tests. For RQ2, I used adjusted multivariate and weighted logistic regression analyses. I performed

these analyses to compare the distributions of the two subsets (HIV screening and no evidence of HIV screening) according to each covariate assessed.

Population

The population included adults residing in New Jersey ages 18 and older surveyed by BRFSS. Data were collected by CDC (2015a) and acquired by NJDOH (2016a) for those surveyed in 2014. Additionally, I linked the BRFSS national data to the NJDOH data sets. Based on the codebook, provided by the NJDOH, the state of New Jersey has approximately 13,045 surveys in BRFSS in 2014.

Sampling and Sampling Procedures

The BRFSS surveillance data included approximately 460,000 individuals who were surveyed nationally. In the BRFSS 2014 national codebook for the data set, there was a sample of approximately 10,000 surveyed in New Jersey in 2014 (CDC, 2015a). The selected BRFSS subset consisted of people who resided in New Jersey in 2014.

Sampling frame. The sampling frame included (a) adults surveyed in BRFSS, (b) ages 18 and older, (c) New Jersey primary or secondary residence, (d) survey year 2014, and (e) all reported races or ethnicities. The sample excluded those who were younger than 18 years because the BRFSS survey did not ask this question to these age groups, as noted in the questionnaire (CDC, 2015a). The population sample included people who were screened for HIV and those for whom no evidence of HIV screening existed. My study was cross-sectional; I only looked at post-Hurricane Sandy in New Jersey.

Data accessibility and permissions. The BRFSS contains questions that are included in the national database and others that are state specific. All questions, except

for Hurricane Sandy, can be downloaded from the CDC website. Accessing the questions relating to Hurricane Sandy that were asked by NJDOH required a data use agreement that was coordinated by the institutional review board (IRB) of an affiliated state university, per a 2015 report, as provided in the ethics section.

Power analysis. Based on the power analysis the required sample size for the logistic regression analysis was 13,000 individuals (power = 0.990; alpha = 0.05; odds ratio = 1.201), as shown in Table 1. This sample size calculation was completed using G*Power calculator for multivariate logistic regression analyses, as discussed by Demindenko (2007). The effect size of the odds ratios was calculated from G*Power's logistic regression analysis sensitivity functional. I use the maximum theoretical sample size of 10,000 with a power of 0.96 as referenced in the CDCs (2016) codebook for New Jersey. The choice of effect size is the odds ratio and was determined through sensitivity analysis to be 1.20. This power calculation (12,990) of the multivariate logistic regression modeling was close to the actual sample size (13,045) of the data set.

Table 1

*Logistic Regression Sample Size Calculation Using G*Power*

Input:	Tail(s)	Two
	Odds ratio	1.201
	$Pr(Y=1\|X=1)$ H_0	0.2
	α err prob	0.05
	Power (1-β err prob)	0.99
	R^2 other X	0
	X distribution	Binomial
	X parm π	0.5
Output:	Critical z	1.9599640
	Total sample size	12,990
	Actual power	0.9900038

Data Collection and Management

The CDC and NJDOH provided a database considered the preeminent source of behavior risk statistics for New Jersey. Data were collected for the purposes of nonresearch public health surveillance, so informed consent was exempted because this study was a monitoring and evaluation investigation. This multilevel study included BRFSS data collected by the NJDOH with some reported to the CDC and other state-specific questions that required a review by the NJDOH IRB after Walden's review, as explained in the ethics section.

Instrumentation

I conducted a quantitative analysis of secondary data collected by the CDC and NJDOH for the BRFSS 2014 survey, to determine access to care post-Hurricane Sandy, with the outcome of interest being people who were screened for HIV. Reliability and validity for this analysis was performed using Kendell-Tau correlations and Cramer's V statistics because the outcome of interest was binary for the New Jersey BRFSS data set.

Operationalization of Variables

Table 2 shows the nominal, ordinal, and binary variables used in this analysis. The variables included age, sex, race/ethnicity, primary health insurance, marital status, MSA status, access to care, and HRQOL. The HRQOL propensity score was calculated by dichotomizing general health status as fair/poor (0) and excellent/very good/good (1), using a 14-day cutoff for the unhealthy days (>14 days [0] vs.≤14 days [1]), as described by Odom et al. (2016). In addition, I summarized the variables by creating a single variable, with scores ranging from zero to four. I used binary dependent and nominal

independent variables, yet the confounders were either nominal or ordinal. The missing values were recoded as valid values for the observation to not be excluded from the final analysis, upon statistical adjustment. The missing data from the following variables were defined as: (a) race/ethnicity variable was recoded as all others, (b) missing primary insurance was recoded as other insurance, (c) MSA status was recoded as other/non-MSA, (d) medical care post-Hurricane Sandy was recoded as unknown, and (e) HIV screening was recoded as not receiving the HIV screening. All other variables were recoded using imputation methods.

Table 2

Operational Definitions of Variables

Name	Type of Measurement	Definition	Variable
Age (confounder)	Nominal	Years of life at time of survey	1=18-24 years 2=25-34 years 3=35-44 years 4=45-54 years 5=55-64 years 6=65 years and older
Sex (confounder)	Nominal	Sex of patient at birth	1=Male 2=Female
Race/ethnicity (confounder)	Nominal	Reported race and ethnicity	1=non-Hispanic White 2=non-Hispanic Black 3=Hispanic 4=All others
HRQOL propensity score (confounder)	Ordinal	Sum-of-score of risk behaviors	0-4
Primary insurance (confounder)	Nominal	Primary health insurance	1=Private: employee 2=Private: individual 3=Medicare 4=Medicaid 5=Other insurances
Marital status (confounder)	Nominal	Marital status	1=Married 2=Divorced 3=Widowed 4=Separated 5=Never married 6=Unmarried
Metropolitan statistical area (confounder)	Nominal	Metropolitan status code	1=Center city 2=Outside center city 3=Suburban county 5=Other/non-MSA
Medical care post-Hurricane Sandy (independent)	Nominal	Need medical care post-Hurricane Sandy	0=No 1=Yes 2=Unknown
HIV screening (dependent)	Binary	Adults that ever been screened for HIV	1=HIV screened 2=Not HIV screened

Data Analysis Plan

I used statistical data analyses including chi-square, unadjusted logistic regression, multivariate adjusted logistic regression, and weighted adjusted logistic regression to estimate odds of being HIV screened. Additionally, I assessed how HIV screening varied by several covariates: age, primary health insurance, race/ethnicity, marital status, MSA status, insurance status, HRQOL propensity score, and access to medical care, by performing all data analysis in Version 23 of Statistical Package for the Social Sciences (SPSS).

Data Cleaning Procedures

The BRFSS survey included data submitted to CDC national database and state-specific questions, such as those relating to Hurricane Sandy. For this analysis, I used the New Jersey's version of BRFSS, which was acquired by a data use agreement. After the data were linked, quality assurance frequencies were used to determine the impact of the combined dataset. Next, all variable data were recoded using the SPSS auto-recode function. I organized all recoded variables into a univariate analysis table and Kendall-Tao correlation matrix to determine level of concordance between variables. Next, I performed chi-square analysis and a binary logistic regression. I applied the weighting or complex sampling function in SPSS to conduct a weighted logistic regression.

Research Questions and Hypotheses

RQ1: Among adults surveyed in the New Jersey BRFSS in 2014, is there an association between HIV screening and demographic characteristics, geographic

attributes, health-related quality-of-life propensity score, access-to-care, and health insurance status?

$H_0$1a: Those who are HIV screened versus those not screened for HIV have no differences in proportions of persons from New Jersey by various age groups.

H_a1a: Those who are HIV screened versus those not screened for HIV have a significant difference in proportions of persons from New Jersey by various age groups.

$H_0$1b: Those who are HIV screened versus those not screened for HIV have no differences in proportions of persons from New Jersey by sex at birth.

H_a1b: Those who are HIV screened versus those not screened for HIV have a significant difference in proportions of persons from New Jersey by sex at birth.

$H_0$1c: Those who are HIV screened versus those not screened for HIV have no differences in proportions of persons from New Jersey by race/ethnicity.

H_a1c: Those who are HIV screened versus those not screened for HIV have a significant difference in proportions of persons from New Jersey by race/ethnicity.

$H_0$1d: Those who are HIV screened versus those not screened for HIV have no differences in proportions of persons from New Jersey by marital status.

H_a1d: Those who are HIV screened versus those not screened for HIV have a significant difference in proportions of persons from New Jersey by marital status.

$H_0$1e: Those who are HIV screened versus those not screened for HIV have no differences in proportions of persons from New Jersey by metropolitan area.

H_a1e: Those who are HIV screened versus those not screened for HIV have a significant difference in proportions of persons from New Jersey by metropolitan area.

$H_0$1f: Those who are HIV screened versus those not screened for HIV have no differences in proportions of persons from New Jersey by health-related quality-of-life propensity score, as defined by general health status, physically unhealthy days per month, mentally unhealthy days per months, and days per month of activity limitation.

H_a1f: Those who are HIV screened versus those not screened for HIV have a significant difference in proportions of persons from New Jersey by health-related quality of-life propensity score.

$H_0$1g: Those who are HIV screened versus those not screened for HIV have no statistical differences in proportions of persons from New Jersey by health insurance.

H_a1g: Those who are HIV screened versus those not screened for HIV have a significant difference in proportions of persons from New Jersey by health insurance.

$H_0$1h: Those who are HIV screened versus those not screened for HIV have no statistical differences in proportions of persons from New Jersey by access-to-care.

H_a1h: Those who are HIV screened versus those not screened for HIV have a significant difference in proportions of persons from New Jersey by access-to-care.

RQ2: Are there statistically significant odds ratios of HIV screening among geographic attributes, health-related quality-of-life propensity score, access-to-care, and health insurance status?

$H_0$2: There are no differences in the odds of HIV screening after adjustment by each of the factors to be investigated, by demographic characteristics, geographic attributes, health-related quality-of-life propensity score, access-to-care, and health insurance status.

H_a2: There are significant differences in the odds of HIV screening after adjustment by each of the factors to be investigated, by demographic characteristics, geographic attributes, health-related quality-of-life propensity score, access-to-care, and health insurance status.

Analysis Techniques

I performed chi-square analyses, in RQ1, to estimate the association of ever being HIV screened as compared to determinants including: demographic qualities, geographic attributes, access to care, and health insurance status. The multivariate and weighted logistic regression analyses also were performed to estimate the odds of screening varied with each predictor accessed, in New Jersey, in RQ2.

Bivariate analyses. I used bivariate 2*X table methodology to define the proportion of individuals, who have ever been screened for HIV, using SPSS software. The dichotomized outcome of interest, HIV screening, required the Pearson's chi-square tests and unadjusted logistic regression modeling, as the primary bivariate analyses performed, for RQ1.

Adjusted analyses. An adjusted logistic regression analysis estimated people who have ever been screened for HIV, versus all other HIV no evidence of HIV screenings, using SPSS software. The analysis used a multivariate and weighted logistic regression model adjusting for risk, demographic, geographic, and insurance coverage. This multivariate and weighted logistic regression is needed to solve RQ2.

Rationale for Covariate Inclusion

The inclusion of demographic characteristics, geographic attributes, and health insurance status, relates to differences in HIV screenings that confounds the relationship with access to care post-Hurricane Sandy. Social-ecologic features including age, race, sex, insurance, marital status, and region were found to have some effect on HIV screening. Therefore, the BRFSS was completed after HIV screening and Hurricane Sandy, so age is a proxy for time.

Interpretation of Results

The structures of the interpretation of results were odds ratios with 95% confidence intervals, for adjusted and weighted logistic models. Probability values were interpreted using for chi square results. In addition, for chi-square tests results, *Cramer's V* or φ effect sizes were used with the ranges of small, 0.100-0.199; medium, 0.300-0.499; and large, greater than 0.500 (Cohen, 1988). I applied Kendell-Tau correlations to address concordance in the dataset, as per Kendell (1938). For the multivariate logistic regression, I used Nagelkerke's R^2 correlation, classification table, and Hosmer and Lemeshow's test for model fit. For the weighted logistic regression models, I used Nagelkerke's Pseudo R^2 correlation and classifications table for determining model fit.

Threats to Validity

The goals of this section on validity are to reduce or address potential limitations of using BRFSS data for this investigation. The BRFSS contains a comprehensive datasets that allows for measuring of a wide variety of different topics and research agenda. The dataset have the following limitations: (a) the questionnaire only asked

noninstitutionalized individuals who are 18 years and older; (b) BRFSS data collection is subject to self-reporting, recall, and nonresponse biases, losing design validity; and (c) probability of missing information, which impacts the results external validity.

External Validity

External validity describes how the design allows assumptions to be generalized outside the limitations of the investigation. BRFSS data has information on adults, which disallows for longitudinal follow-up. I found a probability of missingness impacted the external validity of the reported results, caused by missing not at random. Osborne (2013) suggested the need for recoding values in order to avoid deleting valid observations. This meant that the results of this study were only generalizable to the state of New Jersey.

Internal Validity

Internal validity problems exist when using surveillance data including: choosing the wrong dataset, not having a predetermined goal for the investigation, and not handling potential weighting or complex study designs (Schlomer & Copp, 2014). Additionally, the seven types of extraneous variables that can also impact internal validity include: history, maturation, testing, instrumentation, statistical regression, experimental mortality, and selection-maturation interaction (Schlomer & Copp, 2014). This investigation took place in one year and does not use a repeated measures framework so it is not affected by history. In this analysis all people included are questioned and reported to BRFSS surveys. The measurement methods have not been changed due to judgment of the measurer so the instrumentation barrier is not affected.

Construct Validity

Some areas concern the multilevel conclusions of the statistical analyses. The statistics are only as good as the quality of reported data, losing design validity. Although the cross-sectional design is population-based, the inclusion of individual and population information to this investigation can cause the ecologic fallacy. The gold standards for HIV screening exist, both using treat and treat and the HIV continuum of care, construct validity is not as critical (Gardner et al., 2011; Granich et al., 2009).

Ethical Procedures

This study was officially be a Walden doctoral study project that required a letter of cooperation and a data use agreement from the NJDOH project for a portion of the data needed for this investigation on Hurricane Sandy. The Walden IRB was the official recorder and was first to review the project prior to NJDOH IRBs approval. The NJDOH IRB is partnered with an affiliated state university and requires a separate electronic IRB application process, as per a 2015 agency report. I received the standard Walden IRB approval and the notification of approval to conduct research after the NJDOH data acquisition process was completed.

Permissions

The Walden University's IRB (Approval number=11-11-16-0280041) and NJDOH-affiliated state university's IRB (Approval number=Pro2016001326) both approved this doctoral study. For ethical purposes, the affiliated state university's IRB was the IRB of record and responsible for the data collection and access. Walden IRB oversaw the analysis and results write-up. The NJDOH provided a data use agreement, in

addition to the two IRBs approvals permitting me to conduct this doctoral study, since the data is fair use, but not copyrighted (see Appendix A).

Ethical Concerns

In New Jersey, the populations of people diagnosed with HIV are protected under stricter privacy legislation then the federal legislation protecting disclosure of HIV status and data to unessential peoples. This means that although the state NJDOH is exempt from data collections requirements the HIV confidentiality legislations governs all related data. All study plans must be approved by the department's IRB on ethical issues and expedited status after Walden's approval. I never analyzed the New Jersey subset of the BRFSS or the state-specific questions for Hurricane Sandy; there is no conflict of interest that prevents me from not using the data for my doctoral study. I am employed by one academic institution with an IRB, the project done as part of my Walden doctoral study with no involvement with my employer does not need to go through these organizations IRB. Walden was the IRB to review the project and a data use agreement by the NJDOH.

Treatment of Data

All secondary BRFSS data used in this investigation was examined without full personal identifiers, to avoid an ethical breach. Additionally, any breach or data release is resolved by the NJDOH. HIV is a highly stigmatized condition that impacts vulnerable populations. Also all data that is used for this analysis saved on two Kingston Data-Traveler Vault Privacy 3.0 encrypted flash drives for five years, a requirement of Walden's IRB. This standard was put into place because in the past data was simply emailed or mailed without being encrypted, leading to security breaches. Therefore, all

HIV analyses have to be performed on a computer that has whole disk encryption, even on aggregated results with no personal identifiers.

Summary

Section 2 mentioned the applied research methodology for secondary data, originally collected for the BRFSS in New Jersey. Next, a description of population investigated, sample examined, the research design, data collection procedure, data analysis, and the rationale for the data analysis techniques. Some of the potential ethical concerns including step taken by the NJDOH to preserve confidentiality were discussed. While Section 2 presents the methodology used in the doctoral study, the next section presents results of the findings, relative to the two RQs.

Section 3: Presentation of the Results and Findings

The purpose of my quantitative study was to utilize cross-sectional data to examine determinants to HIV screening after Hurricane Sandy. I examined the socioecological factors (i.e., individual, interpersonal, organizational, community, and policy) impacting HIV screening among residents surveyed in New Jersey. Section 3 includes results of statistical analysis (chi square and logistic regression) on data collected in the New Jersey version of the BRFSS. I provide a brief description of the time frame and response rates, discrepancies in the New Jersey version of the BRFSS data set, descriptive demographics of the sample, representativeness of the sample, and univariate characteristics and analysis of the sample. The study results subsection includes the results of the chi-square tests (RQ1) and the adjusted multivariate and weighted logistic regression modeling (RQ2). I conclude with a summary of the results for the two RQs.

Data Collection of Secondary Data Set

The BRFSS is a health-related telephone survey coordinated by the CDC to collect state data about U.S. residents regarding their health-related risk behaviors, chronic health conditions, use of preventive services, and other health-related issues (CDC, 2015a). The BRFSS was originally started in 1984 in 15 states using a landline-only survey, but now the data set is used to collect cell phone and landline data in all 50 states, the District of Columbia, and three U.S. territories, with a combined sample of more than 400,000 interviews per year (CDC, 2015a). Currently, the BRFSS questionnaire has three components: core components such as the fixed core, rotating

core, and emerging core; optional modules; and state-added questions (CDC, 2015a). Currently, state health department must ask the core component question without modification in wording, but the modules and state-added questions are optional, with only the core and optional modules submitted to the CDC (2015a) monthly. The BRFSS includes a disproportionate stratified sample design, using computer-assisted telephone interview systems (CDC, 2015a). I used the 2014 version of the BRFSS in New Jersey, with state-added questions on access-to-care after Hurricane Sandy; optional insurance questions; and core questions on HIV screening, demographics, and health-related risk behaviors. I used this data set to do chi-square and logistic regression analyses on HIV screening, as required by my two RQs.

Time Frame and Response Rates

Data collection occurred from January 1 to December 31, 2014. The landline response rate (50.3%) and cell phone response rate (37.1%) reported as median rates for New Jersey (CDC, 2015a). The total landline sample for New Jersey was 214,290, and the cell phone sample was 56,690; the eligibility rate was 7.0% for landlines and 7.7% for cell phones (CDC, 2015a). The total combined sample size in the NJDOH dataset from landlines and cell phones was 13,045, for 2014.

Discrepancies in the Data Set

The original data analysis plan included the CDC national data set from BRFSS. However, the analysis lacked originality and focus, so I requested state-specific questions from the New Jersey version of the BRFSS. Some discrepancies that appeared upon

receiving the New Jersey BRFSS data set included missing data, older age groups, sexual orientation, weighted analysis, and Hurricane Sandy questions.

Missing data. I requested the BRFSS data from the NJDOH, but it contained some missing data (5-16%). In the statistical model, I determined that the missing data was not at random, using supplemental analysis noted by Osborne (2013). Osborne noted if values for missing information are not added at random this can introduce bias if not addressed, leading to loss of statistical power. I addressed this problem by recoding or imputing missing responses into valid values.

Older age groups. The original plan was to exclude the values based on the assumption that this question was not asked. Upon receiving the data, I determined that 30% of the sample was 65 years and older, meaning external validity might be compromised if this population were excluded. Based on the high number of cases, I decided to include the values in the final analysis to account for this high percentage.

Sexual orientation. In my original data plan, I was going to adjust for sexual orientation. As noted in the literature review in Section 1, sexual orientation is a confounder for HIV screening in MSM and heterosexual contact subgroups (Reilly et al., 2014; Zaller et al., 2011). However, this question was not asked in the New Jersey version of BRFSS, so I dropped it from my final analysis.

Weighted analysis. The CDC (2015a) used a disproportionate sampling approach necessitating a weighted analysis approach. By using a weighted analysis approach, I could better estimate parameters and standard errors (Osborne, 2013). However, Osborne (2013) noted that including a weighted analysis has a modest effect on a binary logistic

regression model. This meant that although the BRFSS data set was representative, it required weighted analysis to account for the design of the data set with the purpose of increasing external validity. The weighted analysis approach was applied via the weighted logistic regression analysis and reported as weighted odds ratios (WORs).

Hurricane Sandy questions. According to the New Jersey BRFSS codebook, there were 11 access-to-care questions. However, I used only one of the questions. Based on the results of the 11 Hurricane Sandy questions, there was little variation between those who answered yes in these other questions, due to the higher than expected missing data (15-100%). Therefore, I analyzed the question addressing whether individuals accessed medical care post-Hurricane Sandy.

Descriptive Demographics of the Sample

In 2014, 13,045 individuals surveyed in BRFSS were residents of New Jersey. From that sample, 3,835 adults (29.4%) were identified as having been screened for HIV, as shown in Figure 2.

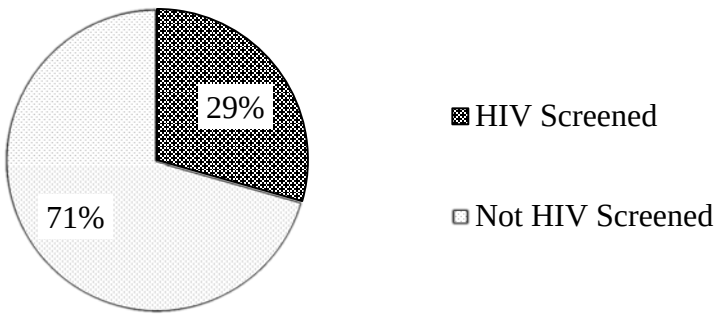

Figure 2. Distribution of participant's screened for HIV in New Jersey BRFSS, 2014.

Representativeness of the Sample

The BRFSS included cell phone surveying to account for the proportion of households with no landlines (CDC, 2015a). To maintain representativeness, the CDC (2015a) changed the weighting methodology from post-stratification to raking in BRFSS, to account for proportions of known demographic characteristics (i.e., age, race, ethnicity, sex, marital status, telephone source, education level, homeowner status, and region) while adjusting for nonresponse bias. In addition, the CDC provided technical support to state health departments including the NJDOH (CDC, 2015a). Therefore, the New Jersey portion of the BRFSS was representative of the general population via raking, which was accounted for by the weighted logistic regression modeling.

Univariate Characteristics of the Sample

Table 3 shows the results of univariate descriptive analyses. The 2014 New Jersey portion of the BRFSS included 13,045 people who responded to the question "Have you even been tested for HIV?" yielding a subset of 3,835 who were HIV screened. The other variables included age, race/ethnicity, sex, marital status, primary insurance, access-to-care, HRQOL score, and MSA status. The problem is the independent variable, access-to-care after Hurricane Sandy, was low for the expected answer, yes, suggesting a data limitation. The number of Medicaid recipients was also low in New Jersey at 4%, another data limitation. A discussion of the significance of the low number of people who answered these two questions is presented in Section 4.

Table 3

Univariate Characteristics of HIV Screening Among Adults, 2014

Characteristics		*N*	*%*
	Total	13,045	100.0
Ever screened for HIV/AIDS	HIV screened	3,835	29.4
	Not HIV screened	9,210	70.6
Age (years)	18-24 years	599	4.6
	25-35 years	1,246	9.6
	35-44 years	1,689	12.6
	45-49 years	2,559	19.6
	50-64 years	3,002	23.0
	≥65 years	3,950	30.3
Race/ethnicity	White, non-Hispanic	8,822	67.6
	Black, non-Hispanic	1,526	11.7
	Hispanic	1,595	12.2
	Others	1,102	8.4
Sex	Male	5,392	41.3
	Female	7,653	58.7
Primary insurance	Private: employee	6,303	48.3
	Private: Individual	1,015	7.8
	Medicare	3,320	25.5
	Medicaid	523	4.0
	Other/Unknown	1,884	14.4
HRQOL score	0	1,329	10.2
	1	7,615	58.4
	2	2,534	19.4
	3	1,252	9.6
	4	315	2.4
Medical care post-Hurricane Sandy	No	10,599	81.2
	Yes	367	2.8
	Unknown	2,079	15.9
Metropolitan code	Center city	1,898	14.5
	Outside center city	2,182	16.7
	Suburban county	5,684	43.6
	Others/non-MSA	3,281	25.2
Marital status	Married	6,866	52.6
	Divorced	1,600	12.3
	Widowed	1,599	12.3
	Separated	354	2.7
	Never married	2,281	17.5
	Unmarried	345	2.6

Study Results

The results of the univariate analysis justified the need for inclusion of covariates. For example, HIV screening accounted for 29% of the sample, yet individual medical care post-Hurricane Sandy accounted for only 3%, suggesting the need for further analysis. This subsection includes the statistical assumptions and results of the two RQs.

Research Question 1

The first RQ asked the following: Among adults surveyed in the New Jersey BRFSS in 2014, is there an association between HIV screening and demographic characteristics, geographic attributes, HRQOL propensity score, access-to-care, and health insurance status?

Statistical assumptions. I analyzed data for RQ1 using crosstabs and Pearson's chi-square. The five assumptions of a chi-square test include (a) individual level data, (b) mutually exclusive categories, (c) independence, (d) nominal or ordinal categories, and (e) values should be five or more in 80% of the cells (McHugh, 2013). All of the chi-square assumptions were met because the groups are nominal or ordinal, mutually exclusive, independent, and had cell counts with more than five individuals.

Crosstab and effect size results. The subset of people with and without the HIV screening outcome had significant chi-square probability values ($p < 0.05$), except for sex. The observed magnitude of effect sizes based on the Cramer's V or φ coefficients ranged from 0.062 to 0.344. Based on this effect size analysis, all of the significant chi-square value results, except for medical care post-Hurricane Sandy (effect size = 0.073) and HRQOL score (effect size = 0.062), had a meaningful difference, as described by

Cohen (1988). I observed that all other significant chi-square test results, except age, had a small effect. Age was the only variable with a medium effect (effect size = 0.344).

Hypotheses test results. There was a statistically significant ($p < 0.05$) association between all independent variables for HIV screening except sex ($\chi^2 = 3.11$, $p = 0.078$), as shown in Table 4. Ages 25-49 years had more HIV screenings ($\chi^2 = 1,547.31$; $p < 0.001$; medium effect size, 0.344) than other age groups. Also, non-Hispanic Blacks and Hispanics had more HIV screenings ($\chi^2 = 673.62$; $p < 0.001$; small effect size, 0.227) than other populations. Participants whose classification was single had the most HIV screenings ($\chi^2 = 677.06$; $p < 0.001$; small effect size, 0.223). Medicaid insurance had the most HIV screenings ($\chi^2=472.32$; $p<0.001$; small effect size, 0.190) out of all insurances. Next, Medical care post-Hurricane Sandy ($\chi^2=213.54$, $p<0.001$, small effect size=0.127) and MSAs codes had differences between the four categories ($\chi^2=150.10$; $p<0.001$; small effect size, 0.107). For HRQOL scores ($\chi^2=50.55$, $p<0.001$, effect size=0.062) has significant probability values but not meaningful effect sizes, as described by Cohen (1988). Therefore seven null hypotheses were rejected, except for sex, suggesting that there is a statistically significant association for most of the variables.

Answers to Research Question 1. My results of the hypothesis tests and effect sizes analyses showed significant associations and meaningful effect sizes for each of the variables; except for sex ($\chi^2=3.11$, $p=0.078$) and HRQOL scores ($\chi^2=50.55$, $p<0.001$, effect size=0.062). The results of the Pearson's Chi Square analysis suggests the need for further analysis as addressed with RQ2, which builds on RQ1, which is investigated in Table 4.

Table 4

Bivariate Characteristics of HIV Screening Among Adults, 2014

Characteristics		HIV screened		Not HIV screened				
		n	*%*	*n*	*%*	χ^2	*p*	*ES*
	Total	3,835	100	9,210	100			
Age (years)	18-24 years	152	4	447	5			
	25-34 years	676	18	570	6			
	35-44 years	877	23	812	9			
	45-49 years	953	25	1,606	17			
	50-64 years	748	20	2,252	25			
	≥65 years	429	11	3,521	38	1,547.31	<0.001	0.344
Race/ethnicity	White, non-Hispanic	2,051	53	6,771	73			
	Black, non-Hispanic	772	20	754	8			
	Hispanic	713	19	882	10			
	Others	299	8	803	9	673.62	<0.001	0.227
Sex	Male	1,540	40	3,852	42			
	Female	2,295	60	5,358	58	3.11	0.078	0.015
Primary insurance	Private: employee	2,048	54	4,255	46			
	Private: Individual	241	6	774	8			
	Medicare	581	15	2,739	30			
	Medicaid	286	7	237	3			
	Other/Unknown	679	18	1,205	13	472.32	<0.001	0.190
HRQOL score	0	398	10	931	10			
	1	2,095	54	5,540	60			
	2	814	21	1,720	19			
	3	431	11	821	9			
	4	117	3	198	2	50.55	<0.001	0.062
Medical care post-hurricane sandy	No	3,283	85	7,316	80			
	Yes	180	5	187	2			
	Unknown	372	10	1,707	18	213.54	<0.001	0.127
Metropolitan code	Center city	683	18	1,215	13			
	Outside center city	580	15	1,608	17			
	Suburban county	1,423	37	4,261	48			
	Others/non-MSA	1,149	30	2,132	23	150.10	<0.001	0.107
Marital status	Married	1,758	46	5,108	55			
	Divorced	568	14	1,032	11			
	Widowed	182	5	1,417	15			
	Separated	189	5	165	2			
	Never married	968	25	1,313	14			
	Unmarried	170	4	175	2	677.06	<0.001	0.223

Note. ES = Effect Size (i.e., Cramer's *V*, nominal; φ, binary); *n*=subsample of cases.

Research Question 2

Are there statistically significant odds ratios of HIV screening among adults, surveyed in the New Jersey BRFSS in 2014, by demographic characteristics, geographic attributes, access-to-care, and health insurance status?

Statistical assumptions. I analyzed RQ2 using a binary logistic regression for unadjusted, multivariate, and weighted analyses. Six assumptions based on the logistic regression methodology, by Hosmer and Lemeshow (2000) include: (a) binary or ordinal dependent variable; (b) factor of one is the desired outcome; (c) model should be fitted correctly; (d) error terms need to be independent; (e) linearity of independent variables and log odds; and (f) dataset has a large sample size. Based on the logistic regression assumptions, all of the rules are met for this analysis. For the multivariate adjusted logistic regression the Nagelkerke's R^2=0.261, correctly classified 75.5% of cases, and non-significant Hosmer and Lemeshow's test for model fit (p=0.572), thereby suggesting a model fit. Whereas, the weighted logistic model the Nagelkerke's Pseudo R^2=0.232 and correctly classified 72.7% of cases.

Kendell-Tao correlation analysis. Table 5 shows the results of a Kendell-Tao correlation matrix. This correlation matrix was chosen because out of the three types it is best for categorical data and addresses the probabilities of concordant and discordant pairs, to address collinearity in the dataset (Kendell, 1938). The results of the matrix shows there is a high agreement of τ>0.60 and τ<-0.60 in none of the values. The results of the Kendell-Tao correlation show that the assumption of logistic regression modeling was met, because the variable and log odds based on the model fit statistics, were linear.

Table 5

Kendell-Tao Correlation Matrix Analysis

Variables	1	2	3	4	5	6	7	8	9
HIV (1)	1.00	-0.28**	0.16**	0.02	0.01	-0.02*	-0.07**	0.04**	0.10**
Age (2)	-0.28**	1.00	-0.23**	0.04**	-0.18**	0.15**	-0.09**	-0.13**	-0.09**
Race (3)	0.16**	-0.23**	1.00	-0.01	0.05**	0.13**	0.14**	-0.07**	0.11**
Sex (4)	0.08	0.04**	-0.01	1.00	-0.10**	0.01	-0.01	0.04**	0.07**
MSA (5)	0.01	-0.18**	0.05**	-0.10**	1.00	0.02**	0.07**	0.04**	0.03**
Insurance (6)	-0.02*	0.15**	0.13**	0.01	0.02**	1.00	-0.09**	-0.11**	0.22**
Medical care (7)	-0.07**	0.09	-0.14*	-0.01	-0.07**	0.09**	1.00	-0.02**	0.02**
HRQOL (8)	0.04**	-0.13**	-0.07**	0.04**	0.04**	-0.11**	0.02**	1.00	0.01
Marital (9)	0.11**	-0.09**	0.11**	0.07**	0.03**	0.22**	-0.02**	0.01	1.00

Note. *$p < 0.05$, two-tailed; **$p<0.01$, two-tailed.

Multivariate logistic regression results. People who ever screened for HIV have an equal odds for a HIV screening for female sex are for the multivariate odds ratios. Additionally, the odds in people who ever screened for HIV was greater for: (a) 40-50 years (*OR*=2.17, *95%CI*=1.72-2.74) and each younger age group greater than 24 and less than 50 years compared to 18-24 years; (b) non-Hispanic blacks (*OR*=2.85, *95%CI*=2.50-3.25) and Hispanics (*OR*=1.64, *95%CI*=1.44-1.87) compared to non-Hispanic whites; (c) Medicaid (*OR*=1.64, *95%CI*=1.44-1.87) compared to Private: Employee; (d) all marital statuses except for widowed; and (e) enrolled in medical treatment post-Hurricane Sandy (*OR*=1.74, *95%CI*=1.38-2.21) as compared to not enrolled in medical treatment. The odds of ever tested for a HIV screening was less likely to include: (a) >=65 years (*OR*=0.46, *95%CI*=0.35-0.60) compared to 15-24 years; (b) HRQOL score 1 (*OR*=0.81, *95%CI*=0.70-0.94) as compared to HRQOL score of 0; (c) suburban county (*OR*=0.80, *95%CI*=0.71-0.91) and other/non-MSAs (*OR*=0.87, *95%CI*=0.76-0.91) compared with center city; (d) unknown enrollment in medical treatment (*OR*=0.34, *95%CI*=0.30-0.39) compared to no enrollment in medical treatment; and (e) widowed (*OR*=0.79, *95%CI*=0.65-0.96) compared to married.

Weighted logistic regression results. People who ever screened for HIV have an equal odds for a HIV screening for higher HRQOL statuses for WORs. Additionally, the odds in people who ever screened for HIV was greater for: (a) females (*WOR*=1.16, *95%CI*=1.02-1.32); (b) 40-49 years (*WOR*=2.37, *95%CI*=1.76-3.18) and each younger age group greater than 24 years and less than 50 years compared to 18-24 years; (c) non-Hispanic blacks (*WOR*=2.69, *95%CI*=2.22-3.27) and Hispanics (*WOR*=1.51, *95%CI*=1.26-1.80) compared to non-Hispanic whites; (d) Medicaid (*WOR*=1.54, *95%CI*=1.12-2.12) compared to Private: Employee; (e) all marital statuses except for widowed and unmarried; and (f) enrolled in medical treatment post-Hurricane Sandy (*WOR*=1.91, *95%CI*=1.35-2.69) as compared to not enrolled in medical treatment;. The odds of ever tested for HIV screening was less likely to: (a) other races (*WOR*=0.70, *95%CI*=0.56-0.90) compared to non-Hispanic whites; (b) greater than or equal to 65 years (*WOR*=0.50, *95%CI*=0.35-0.71) compared to 18-24 years; (a) Private: individual (*WOR*=0.78, *95%CI*=0.62-0.99) as compared to Private: Employee; (d) suburban county (*WOR*=0.79, *95%CI*=0.64-0.96) compared with center city; (e) unknown enrollment in medical treatment (*OR*=0.42, *95%CI*=0.35-0.51) compared to not enrolled in medical treatment; and (f) widowed (*OR*=0.77, *95%CI*=0.59-0.99) compared to married.

Hypothesis test result. There are differences in the odds of HIV screening after adjustment by each of the factors to be investigated, by demographic characteristics, geographic attributes, access-to-care, health-related quality of life propensity score, and health insurance status. Therefore, the null hypothesis for RQ2 is rejected, based on the significant odds ratios and 95% confidence intervals.

Answers to Research Question 2. After statistically adjusting for the covariates, I found a statistically significant multivariate and weighted odds ratios with access-to -care post-Hurricane Sandy and HIV screening (*OR*=1.74, *95%CI*=1.38-2.21; *WOR*=1.91, *95%CI*=1.35-2.69). Additionally, in the unadjusted logistic models, based on just the raw cell counts, the results were comparable with the chi-square analysis addressed in RQ1. For the adjusted multivariate analysis, there was no significance difference with sex and HIV screening. However, when accounting for the general population, through weighted logistic regression modeling, there was a significant difference by sex and HIV screening (males vs. females; *WOR*=1.16, *95%CI*=1.02-1.32). I also found that despite Medicaid recipients only accounting for 4% of the total sample, for HIV screening this subpopulation accounted for 7% unadjusted. However, after multivariate and weighted adjustment this population (Medicaid vs. Private: Employee; *OR*=1.72, *95%CI*=1.40-2.12; *WOR*=1.54, *95%CI*=1.12-2.12) accounted for the greater odds out of all the insurance coverages surveyed in New Jersey. Additionally, although non-Hispanic blacks and Hispanics they accounted for 39% of HIV screenings in New Jersey, and had significant odds ratios in both multivariate and weighted logistic regression results (non-Hispanic blacks vs. non-Hispanic Whites; *OR*=2.85, *95%CI*=2.50-3.25; *WOR*=2.69, *95%CI*=2.22-3.27) and (Hispanics vs. non-Hispanic whites; *OR*=1.64, *95%CI*=1.44-1.87; *WOR*=1.51, *95%CI*=1.26-1.80). I am presenting in this adjusted logistic regression analyses that HIV screening in New Jersey is still operating as risk-based and not as a true opt-out in 2014, in Table 6.

Table 6

Odds of HIV Screening Among Adults Surveyed in New Jersey, 2014

Variable	HIV screened *N*=3,835	Not HIV screened *N*=9,210	Unadjusted odds ratio *OR*	*95% CI*		Multivariate odds ratio *OR*	*95% CI*		Weighted odds ratio *OR*	*95% CI*	
Age(years)											
18-24 years (ref.)	152	447	1.00			1.00			1.00		
25-34 years	676	570	3.49	2.81	4.33	4.02	3.19	5.08	4.19	3.14	5.59
35-44 years	877	812	3.17	2.58	3.91	4.13	3.26	5.23	3.87	2.87	5.22
45-49 years	953	1,606	1.75	1.43	2.13	2.17	1.72	2.74	2.37	1.76	3.18
50-64 years	748	2,252	0.98	0.80	1.19	1.16	0.92	1.47	1.32	0.97	1.80
≥65 years	429	3,521	0.36	0.29	0.44	0.46	0.35	0.60	0.50	0.35	0.71
Race/ethnicity											
White, non-Hispanic (ref.)	2,051	6,771	1.00			1.00			1.00		
Black, non-Hispanic	772	754	3.38	3.02	3.78	2.85	2.50	3.25	2.69	2.22	3.27
Hispanic	713	882	2.66	2.38	2.98	1.64	1.44	1.87	1.51	1.26	1.80
Others	299	803	1.23	1.07	1.42	0.95	0.81	1.12	0.70	0.56	0.90
Sex											
Male (ref.)	1,540	3,852	1.00			1.00			1.00		
Female	2,295	5,358	1.07	0.99	1.16	1.03	0.94	1.15	1.16	1.02	1.32
Primary insurance											
Private: employee (ref.)	2,048	4,255	1.00			1.00			1.00		
Private: individual	241	774	0.65	0.55	0.76	0.92	0.78	1.07	0.78	0.62	0.99
Medicare	581	2,739	0.44	0.40	0.49	1.12	0.96	1.30	1.12	0.88	1.42
Medicaid	286	237	2.51	2.10	3.00	1.72	1.40	2.12	1.54	1.12	2.12
Others/unknown	679	1,205	1.17	1.05	1.30	1.02	0.90	1.16	0.93	0.78	1.11
HRQOL score											
0 (ref.)	398	931	1.00			1.00			1.00		
1	2,095	5,540	0.88	0.77	1.00	0.81	0.70	0.94	0.88	0.69	1.13
2	814	1,720	1.11	0.96	1.28	0.91	0.76	1.08	0.98	0.75	1.27
3	431	821	1.22	1.04	1.45	0.97	0.80	1.18	1.03	0.77	1.39
4	117	198	1.38	1.07	1.78	1.12	0.83	1.50	1.45	0.95	2.24
Medical care post-Hurricane Sandy											
No (ref.)	3,283	7,316	1.00			1.00			1.00		
Yes	180	187	2.15	1.74	2.64	1.74	1.38	2.21	1.91	1.35	2.69
Unknown	372	1,707	0.49	0.43	0.55	0.34	0.30	0.39	0.42	0.35	0.51
Metropolitan code											
Center city (ref.)	683	1,215	1.00			1.00			1.00		
Outside center city	580	1,608	0.64	0.56	0.74	0.92	0.78	1.07	0.84	0.66	1.06
Suburban county	1,423	4,261	0.59	0.53	0.66	0.80	0.70	0.91	0.79	0.64	0.96
Others/non-MSA	1,149	2,132	0.96	0.85	1.08	0.87	0.76	0.99	0.85	0.69	1.04
Marital status											
Married (ref.)	1,758	5,108	1.00			1.00			1.00		
Divorced	568	1,032	1.60	1.42	1.80	1.83	1.61	2.09	1.91	1.59	2.31
Widowed	182	1,417	0.37	0.32	0.44	0.79	0.65	0.96	0.77	0.59	0.99
Separated	189	165	3.28	2.68	4.13	2.21	1.74	2.80	2.45	1.71	3.53
Never married	968	1,313	2.14	1.94	2.37	1.58	1.39	1.78	1.38	1.15	1.66
Unmarried	170	175	2.82	2.27	3.51	1.88	1.48	2.41	1.31	0.92	1.88

Note. *OR* = odds ratio; *CI* = confidence interval; *n* = subsample of cases; ref. = reference group.

Summary

Section 3 presented the results and findings of my doctoral study. In this section included the study purpose, data collection schema, results of the descriptive and influential statistics of the hypotheses and RQs, and the key findings. This doctoral study examined data collected from the 2014 BRFSS survey between the binary dependent, ever screened for HIV; independent, medical care post-Hurricane Sandy; or confounder variables.

The significant results of the probability values and meaningful effect sizes (i.e., age, race/ethnicity, primary insurance, metropolitan code, and marital status) suggest the need for further analysis as addressed with RQ2. The second RQ builds on RQ1, by adjusting for each characteristic investigated, via a logistic regression model. For the adjusted and weighted logistic regression models, there was a significant odds ratios with access-to-care post-Hurricane Sandy and HIV screening (*OR*=1.74, *95%CI*=1.38-2.21; *WOR*=1.91, *95%CI*=1.35-2.69). I am suggesting that after adjustment HIV screening increased two years after Hurricane Sandy in New Jersey, amongst those in medical services.

A detailed analysis and interpretation of the findings presented in the current doctoral study is the topic of Section 4. The next section serves to overview the interpretations, limitations, recommendation, interpretations, and conclusions that are relevant to this doctoral study. A comparison of findings to the SEM and to the relevant literature is also provided, in Section 4.

Section 4: Application to Professional Practice and Implications for Social Change

The purpose of my quantitative cross-sectional study was to examine the determinants to HIV screening and to determine whether factors predict the use of HIV screening in this sample population. Findings for the adjusted multivariate analysis indicated no significant associations between health-related quality-of-life score and sex, and odds to obtain HIV screening. However, when accounting for the general population via weighted logistic regression adjustment, there was a significant odds ratio for sex and HIV screening. My purpose for this study was to identify in a subset of adults the key determinants of HIV screening in a given year in New Jersey. Section 4 includes an interpretation of the findings, limitations of the study, recommendations for further study, and implications for professional practice and positive social change.

Interpretation of the Findings

My analyses of the NJDOH data indicated significant associations and odd ratios between the likelihood of seeking HIV screening and most of the variables investigated (age, race/ethnicity, primary insurance, metropolitan code, and marital status). In the following subsection, I compare findings to the literature and to the SEM framework.

Findings to Literature

Findings suggested that the promotion of HIV screening in New Jersey has not been fully integrated into normal medical practice, due to only 29% of adults 18 years and older were HIV screened in New Jersey. U.S. national policies stipulate that HIV screening be offered to everyone and test kits be reimbursable by insurance (Branson et al., 2006; Viall et al., 2016). The following subsections present findings broken down by

variables including sex, race/ethnicity, age, marital status, MSAs, insurance status, HRQOL score, and access-to-care.

Sex. With the exception of the weighted logistic modeling for sex, where females had higher odds of being screened than males, there was an equal odd of being screened. This contrasted with Ansa, White, Chung, and Smith (2016) who found, in 2011-2015, that females in Georgia had greater odds of being screened. The reason for the difference may have been Ansa et al's 4-year pooled BRFSS data compared to my data, which included only one year. Future investigators should conduct a sex-stratified logistic regression analysis to understand other possible reasons for these discrepancies.

Race/ethnicity. Among racial/ethnic groups, non-Hispanic Blacks and Hispanics had greater odds of being screened; other races had lesser odds for screening. Ansa et al. (2016) found greater odds of being screened among non-Hispanic Blacks but equal odds for all other racial/ethnic groups in Georgia from 2011-2015. Geyer et al. (2013) published an adjusted analysis of 50-64 year olds in California and found lesser odds in the other race group. My results aligned with Ansa et al.'s and Geyer et al.'s that non-Hispanic Blacks and Hispanics have greater odds for HIV screening compared to other races. The general population of New Jersey is 60% non-Hispanic Whites (United States Census Bureau, 2016); non-Hispanic Blacks and Hispanics accounted for 39% of the HIV screenings in the state, in 2014. Since the BRFSS is a cross-section of the New Jersey's Census population, the results are comparable and suggest that non-Hispanics and other races should be effectively screened.

Age groups. As compared to 18-24 year olds, there was a decreasing amount of HIV screening in older age groups. This finding is consistent with Ford et al.'s (2015) findings that in New Jersey in 2014 CDC HIV testing recommendations showed a downward trend in participants 50-64 years old. Ansa et al. (2016) used 55 and older as the reference group, which was difficult to compare to this investigation. Despite the differences in reference groups, the results showed a downward trend where 25-34 year olds have greater odds than 65 year olds of being HIV screened.

Marital status. Compared to married couples, single subgroups (i.e., separated, widowed, separated, unmarried, and never married) generally had greater odds of being screened in New Jersey. This greater odd finding was consistent with Ansa et al. (2016) using Georgia's BRFSS information. Both Ford et al. (2015) and Roundtree et al. (2009) found similar results in older analyses of BRFSS data. Morooka and Lampkins (2014) found that married, non-Hispanic Black females had lesser odds of HIV screening, suggesting that married individuals may have a mistaken belief that people in a monogamous relationship do not acquire the infection, which is viewed as primarily affecting MSM and IDU. This mistaken belief among married couples may prevent the full implementation of opt-out screening.

MSA status. MSAs residing in central city had greater odds of being screened than non-MSAs, except in weighted analysis which only showed in suburban counties. This finding is consistent with Ransome et al. (2015) who found significant geographical disparities for HIV screening in areas of New York City farther from clinics. Another reason for the rural-urban divide in this study may be the low number of interviews of

non-MSAs (Ansa et al., 2016). The results of my analysis suggest that urban areas had greater odds to be screened for HIV than suburban areas in New Jersey.

Primary health insurance. People on Medicaid had greater odds of being HIV screened than those with private insurance, despite the low number of cases (4%) in New Jersey. Ansa et al. (2016) made this question yes/no and found equal odds of being HIV screened in Georgia. However, in studies that separated the various types of insurance, Medicaid enrollees had greater odds of being HIV screened than those with other insurance policies (Berry et al., 2016; Dietz et al., 2015). Dietz et al. (2015) used a convenient sample of outpatient and laboratory claims from Medicaid and commercial insurances; my analysis included the self-reported primary insurance from BRFSS, but indicated comparable results suggesting the lack of evidence for routine HIV screening. Berry et al. (2016) focused on HIV treatment from Ryan White clinics, and findings also supported the lack of evidence for HIV screening, which is inconsistent with current policies.

HRQOL score. After adjustment, those with HRQOL scores higher than 1 had equal odds of being HIV screened, using a sum-of-scores of four core variables in BRFSS. Odom et al.'s (2016) definition of HRQOL on cardiovascular health analyzed the results independently in the statistical model; whereas, Bucciardini et al. (2016) improved this procedure by using a factor analysis. My findings suggested the need for HIV screening investigations to include a consistent and validated definition of HRQOL score; measured either independently as multiple variables or using a factor analysis approach.

Access-to-care after Hurricane Sandy. Findings from my study indicated that people who were in medical services after Hurricane Sandy had greater odds of being HIV screened. However, when accounting for the approximately 16% missing data in the variable showed that people with unknown status had lesser odds of being linked to care. This finding was an extension of the investigation by Davidlow et al. (2016) on access-to-care using BRFSS data that did not address HIV screening nor unknown access to care status. I suggest the need for a pre- and post-Hurricane analysis that compares HIV trends before and after a natural disaster.

Findings to SEM Theoretical Framework

I applied the SEM framework, as indicated by the CDC (2015b), to address the individual, interpersonal, organizational, community, and policy levels. To account for multilevel determinants of HIV screening after Hurricane Sandy, I addressed these levels individually.

Individual. HIV tends to affect those with lower income (Johnson et al., 2013), suggesting the need for screening of those individuals. Ford et al. (2015) found a need for screening adults 65 and older who are not targeted by CDC current policy but may still engage in risky behaviors. In addition, future investigators should develop individualized HIV opt-out screening plans in different demographic subpopulations by age, sex, and race/ethnicity groups.

Interpersonal. Marital status corresponds to the interpersonal aspects of the SEM, where people who are married or widowed have lesser odds of having been HIV screened. The interpersonal component after adjustment showed that people may have

better familial relationships, and married people have lesser odds of being screened than singles, as reported by Ansa et al. (2016). My findings suggest that opt-out HIV screening is not effectively capturing married couples or widowed individuals in New Jersey's testing programs.

Organizational. When Hurricane Sandy hit in 2012, it tended to impact areas of New Jersey with limited resources and individuals with limited home owners and health insurance (III, 2016). People enrolled in Medicaid had greater odds of being screened for HIV then those who have other insurance payers. Therefore, there was a great missed opportunity for HIV screening that existed by not ignoring those individuals after Hurricane Sandy. This is encountered when out of the people who were unknown access to care status, had lesser odds of being HIV screened. Dietz et al. (2016) concurred that missed opportunities to advance HIV guidelines and organizational efforts should increase routine HIV screening in health care settings. Findings from my study suggest the need for sustaining programs that promote opt-out screening in people in New Jersey who are on private or Medicare insurances.

Community. In New Jersey's communities, as accounted for by the MSA status variable, there was a difference between urban MSAs and rural non-MSAs., except in weighted non-MSA adjustment analysis. Moyer (2013) stressed the need to educate communities about HIV screening guidelines. McElfish et al. (2016) suggested the need for community-based participatory research (CBPR) to understand this urban-rural divide in HIV screening. I encourage future investigators to use a CBPR approach to help

account for the urban-rural divide that persists in the promotion of opt-out screening in New Jersey.

Policy. CDC promotion of universal HIV screening as applied to the New Jersey subset of the BRFSS has failed to promote effective testing, partly due to compromised resources after Hurricane Sandy. Ortega et al. (2015) suggested the need to expand coverage in the Hispanic population and to increase the number of physicians. In addition, economic opportunity is associated with self-reported health and health behaviors, and policies expanding economic opportunities might have spillover effects on health (Venkataramani et al., 2016). Ford et al. (2015) found striking inconsistencies in HIV testing policies among older populations that increased the need for routine screening. Viall et al. (2016) stated that by promoting active participation among a wide range of stakeholders, more people may benefit by multiple HIV screening guidelines. Policies that promote opportunities for screening may increase the health of people involved in a hurricane.

Summary of Key Findings and Interpretations

Only 29% of adults age 18 and older are effectively HIV screened, suggesting a need for routine screening in New Jersey. However, among Medicaid recipients (4%) in New Jersey more than half of these groups were screened for HIV. This suggests that people with other coverage are not being offered the chance to receive HIV screening and that the guidelines are not being followed appropriately (Berry et al., 2016; Dietz et al., 2015). Additionally, the equal odds in HRQOL score suggests that the sum-of-score is inadequate for addressing the complexity, suggesting the need for factor analysis

approaches. Venkataramani et al. (2016) recommended education of the providers and the general public about the economic opportunity in receiving HIV screening. Findings also suggest the need for investigating HIV screening before and after a hurricane.

Limitations of the Study

Limitations with the New Jersey state-specific BRFSS data set impacted generalizability, validity, and reliability of findings. The CDC (2015a) noted self-reported information in the BRFSS data set, using a complex weighting design requiring data cleanup and statistical adjustment. Osborne (2013) noted the statistics are only as good as the quality of reported data, meaning that the 5-16% of missing impacted external validity, unless they were included in the analysis. Subramanian, Jones, Kaddour, and Krieger (2009) stated that in a cross-sectional study design, the inclusion of multilevel information can be biased due to the ecological fallacy. In addition, Subramanian et al. mentioned although the ecological fallacy may be reduced, the population heterogeneity could possibly lead to interpretation problems. Additionally, using data from 1 year with optional and state-added questions made it hard to compare with studies addressing many years, such as Ansa et al.'s (2016). The independent variable, access-to-care post-Hurricane Sandy, showed a significant association with HIV screening, but the sample percentage that answered yes was only 3%. The access to care variable had 16% missing data, but had a small effect size in the unadjusted Cramer's V analysis. This problem with small sample size was also observed with Medicaid recipients as only 4% of the sample were surveyed in New Jersey. Additionally, education status was not analyzed in this analysis because of high nonparametric

Kendell-Tao and Spearman's correlation coefficients with age (τ =0.38; ρ=0.48) and primary health insurance (τ =0.36; ρ=0.43), along with income for comparable reasons, suggesting some agreement and concordance. Lastly, Hayek et al. (2015) questioned the validity of the newer BRFSS for trend analysis; the revised questionnaire is largely not analyzed, providing ample opportunity for future investigations using BRFSS data.

Recommendations

There are several recommendations that might advance findings in HIV screening for hurricane research. First, this study needs to be replicated using pre- and post-hurricane analyses to capture changes in demographic, societal, geographic, and other demographic characteristics. Second, the sample was limited to one state in the Mid-Atlantic region of the United States, suggesting the need for multistate or international collaborations to understand the impact of hurricane impact. Third, the marginal significance ($p< 0.10$) of sex in the unadjusted and multivariate logistic models, but a significant weighted logistic model, suggests the need for sex-stratified logistic regression modeling, to account for this discrepancy. Fourth, I coded HRQOL using a sum-of-score and not a factor analysis, suggesting the need for developing more systematic approach for analyzing this score, as suggested by Bucciardini et al. (2016). Fifth, the 2014 New Jersey BRFSS has approximately 20 additional state-specific questions on Hurricane Sandy on disaster preparedness that may account for other problems not investigated such as mold, carbon monoxide, radon gas, and other environmental questions, which were outside the focus of this investigation, but noted by Blake et al. (2013). Subramanian et al. (2009) suggested that multilevel analyses are a

necessary in order to understand the complex human-ecological relationships. Baral et al. (2013) added that future epidemiologic studies need to continue in the investigation of multiple levels of HIV risk. I recommend the need for studies to understand the need for HIV screenings before and after a national disaster, such as Hurricane Sandy in New Jersey. Lastly, I also suggest the need for future investigators to take advantage of the newer sampling schema using both landline and cellular phones, to improve the validity and generalizability of BRFSS to the New Jersey population.

Implications for Professional Practice and Social Change

This section provides recommendations to professional practice and positive social change implications relevant to HIV screening after Hurricane Sandy. After a natural disaster, like Hurricane Sandy, there is an opportunity to reach out to a wider population for effective HIV screening that is a potential missed opportunity for adults aged 18-64 years to get tested.

Professional Practice

I am guiding this investigation to be a good exploratory examination for access-to-care and HIV screening post-Hurricane Sandy. I am suggesting the methodological, theoretical, and empirical applications to professional practice, in this subsection.

Methodological. This analysis can be improved by using a factor analysis, path analysis, life table analysis, geospatial mapping, and other statistical approaches. I used a sum-of-score for HRQOL instead of factor analysis, suggested by Bucciardini et al. (2016), since one of the fields used was nominal and the other three variables were continuous. Path analysis could also have been used to ensure that variability exist to

conduct the investigation, as applied by Wind and Komproe (2012). Since the data was cross-sectional and not pre- or post-Hurricane it was challenging to do a time-to-event analysis, which also could have enhanced the investigation, as used by Brilleman et al. (2017). Haraguchi and Kim (2016) suggested GIS mapping techniques and a Bayesian network as a tool to monitor natural disaster as a risk analysis. Despite not using a factor, path, life table, geospatial mapping, and other statistical approaches; the binary logistic regression models showed that in the post-Hurricane Sandy analysis that HIV screening could be utilized after a natural disaster, in New Jersey.

Theoretical. I am suggesting that my attempt to model a cross-sectional survey into a social-ecologic system, combines human-environment interactions, from screening after a hurricane. Schlüter et al. (2017) found that the vast majority of theoretical models are scattered in the social sciences that are not relatable to human-environment interactions. Schlüter et al. provided a way to formalize social science theories that are more relatable to inform policy making via the modeling human behavior framework, which may be more useful than just relying on SEM alone. This implies the need for human-interaction studies to use a variety of diverse theories into professional practice.

Empirical. I suggest that an empirical implication for this social-ecologic investigation may help to promote sustainability to HIV screening. McElfish et al. (2016) proposed that efforts to address health disparities at social-ecological levels coupled with a CBPR approach can promote sustainability of the intervention by engaging the broader community. McPhearson et al. (2016) add that there is a need for empirical social-ecologic level investigations to understand the complex relationships among social,

economic, ecological, and infrastructure systems. Both of these articles suggest pathway for advancing the goals of social-ecologic system for improving sustainability and resilience, conserving diversity, and promoting well-being (McElfish et al., 2016; McPhearson et al., 2016). HIV screening interventions need improvement in a complex social-ecologic system, after a hurricane requiring stakeholder collaborations.

Positive Social Change

The findings support Walden's mission by understanding of the determinants of the odds of individual screening for HIV. The aim is to use the results to create initiatives to raise awareness and to identify risk factors that are associated with access-to-care post-Hurricane Sandy. This investigation suggests at the individual level that in New Jersey there is a need for developing adapted HIV screening plans to promote opt-out testing. At the interpersonal level, opt-out HIV screening is not capturing these married or widowed individuals in New Jersey's testing programs. At the organizational level, there is a need for sustaining programs that promote opt-out HIV screening in people who are on either private or Medicare insurance plans, in New Jersey. Communities need effective HIV screening training to educate populations about the various HIV-related guidelines. The societal or policies having effective and consistent guidelines that promote HIV screening opportunities can increase the health of people involved in a hurricane. The hope for this post-Hurricane Sandy analysis leads to more natural disaster impact studies for other infectious or chronic diseases.

Conclusion

I identified the relationship between the odds of residents to seek HIV screening and access-to-care post-Hurricane Sandy, adjusted by age, sex, HRQOL score, race/ethnicity, primary insurance, metropolitan code, and marital status affecting surveyed adults, in New Jersey's BRFSS. This investigation was not a pre/post study and only explored post-Hurricane Sandy data, future investigators are needed to explore the determinants between the likelihood of HIV screening before and after a natural disaster. Blake et al. (2013) noted a need for investigating other environmental factors that occurred before and after Hurricane Sandy, such as mold, carbon monoxide, and radon gas, which may be determinants to needing key medical services, such as HIV screening. People who live in hurricane-prone areas should develop realistic, HIV-screening plans that account for key medical services (Pouget et al., 2015); via a social-ecological level analyses coupled with a CBPR approach in order to promote sustainability of the intervention by engaging the broader community (McElfish et al., 2016). Stakeholders need to integrate HIV screening into routine medical treatment, by improving public health practice in New Jersey.

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Appendix A: Data Use Agreement

NEW JERSEY DEPARTMENT OF HEALTH
CENTER FOR HEALTH STATISTICS AND INFORMATICS

AGREEMENT FOR RELEASE OF NON-CONFIDENTIAL DATA

I agree to observe the following conditions of use of the New Jersey data files listed below which are being released to me and of information derived from these files:

1. The files will be used only to accomplish the research project as described in writing to CHS on 12/6/16 (date).
1. None of these files, or any files extracted or derived from them, will be released to any other organizations or individuals without CHS approval.
2. No attempt will be made to identify any specific individuals for whom records are included in these files.
3. No attempt will be made to link information from any other source to records for specific individuals for whom records are included in these files, unless expressed authorization is received from CHS. This provision, however, does not preclude statistical matches of individuals' records; i.e., those matches carried out by linking records for persons with similar characteristics, without attempting to ascertain that both records do, in fact, pertain to the same person.
4. Nathaniel Geyer (name) will be designated as custodian of these files and will be responsible for observance of all conditions of use and for establishment and maintenance of physical and electronic security arrangements to prevent unauthorized use. If the custodianship is transferred within the organization, CHS will be notified promptly. This individual must have the legal authority to keep the information confidential and maintain confidentiality.
5. No listing of information from individual records, with or without identifiers, will be published or otherwise released by the holder of these files. No statistical tabulations or research results will be released which reveal information about identifiable individuals.
6. Subject to conditions 2 and 6, statistical and research results derived from these files may be published. However, no results may be copyrighted without the permission of NJDHSS.
7. Feedback to CHS regarding any errors in the data which may be encountered will be provided so that necessary quality improvement efforts can be undertaken.

I understand that any violation of the above conditions may result in prosecution under all relevant state and federal laws.

File/Description: BRFSS data

Requestor (print name): Nathaniel Geyer

Company/Agency: Rowan

Released to (print name, if other than Requestor):

Signature: Nathaniel Geyer

Date of Receipt: 12/6/16